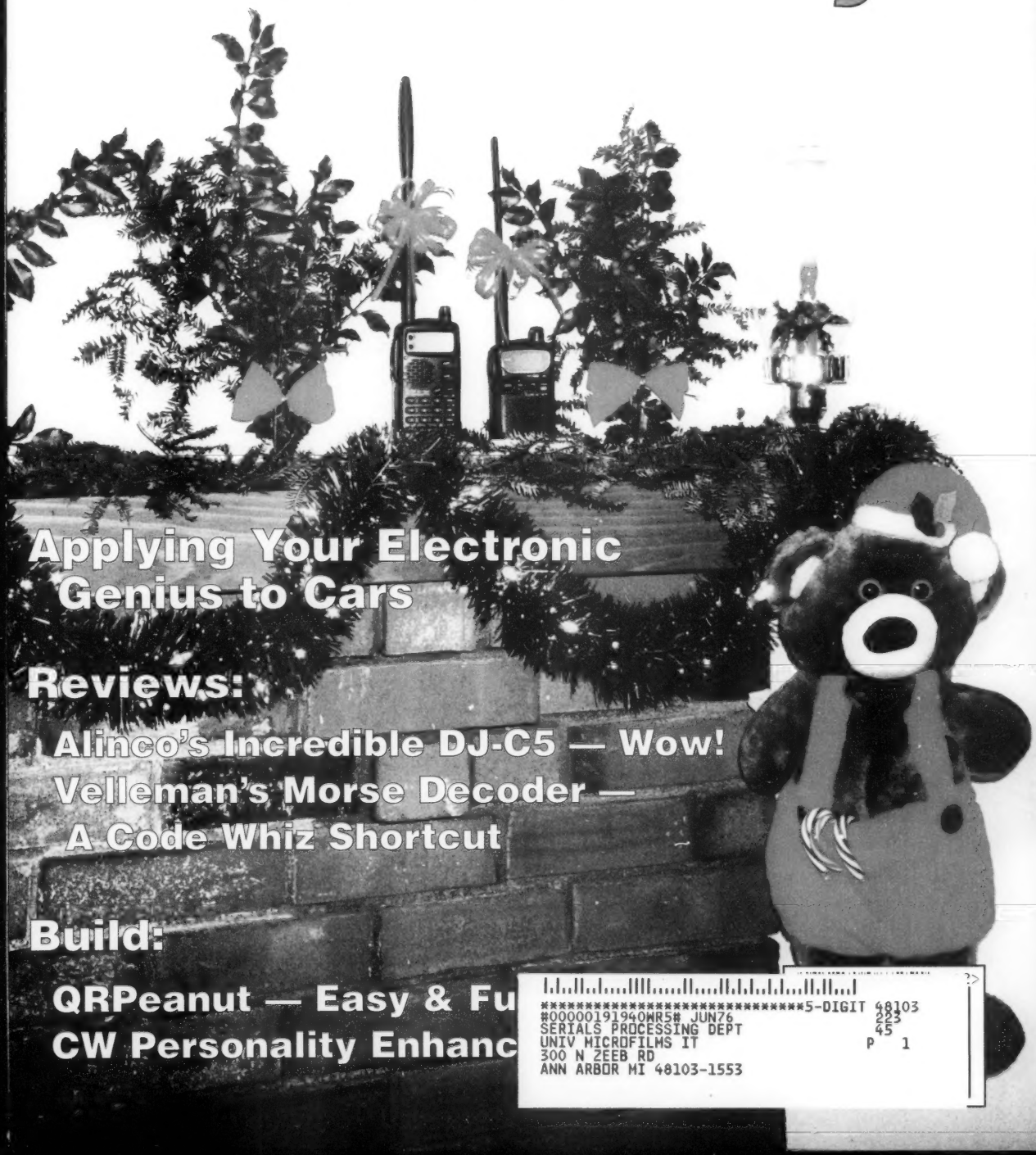
73® Amateur Radio Today

DECEMBER 1998
ISSUE #459
USA $3.95
CANADA $4.95



Applying Your Electronic Genius to Cars

Reviews:

Alinco's Incredible DJ-C5 — Wow!
Velleman's Morse Decoder —
A Code Whiz Shortcut

Build:

QRPeanut — Easy & Fu
CW Personality Enhanc

*****5-DIGIT 48103
#0000019194OWR5# JUN76 223
SERIALS PROCESSING DEPT 45
UNIV MICROFILMS IT P 1
300 N ZEEB RD
ANN ARBOR MI 48103-1553

Get more features for your dollar with our

REP-200 REPEATER

A microprocessor-controlled repeater with full auto-patch and many versatile dtmf remote control features at less than you might pay for a bare bones repeater or controller alone!

- ***kit still only $1095***
- ***factory assembled still only $1295***

50-54, 143-174, 213-233, 420-475 MHz. (902-928 MHz slightly higher.)
☛ **FCC type accepted** for commercial service in 150 & 450 MHz bands.

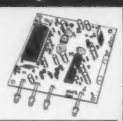
Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements!** ..... **only $100.**

REP-200C Economy Repeater. Real-voice ID, no dtmf or autopatch. ..... Kit only $795, w&t $1195.

REP-200N Repeater. Without controller so you can use your own. ..... **Kit only $695, w&t $995.**

You'll KICK Yourself
If You Build a Repeater
Without Checking Out Our Catalog First!

Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.



COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer. ..... **only $49/kit, $79 w/t.**

CWID. Traditional diode matrix ID'er. ..... **kit only $59.**

CWID-2. Eprom-controlled ID'er. ..... **only $54/kit, $79 w/t.**

DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. ..... **$59/kit, $99 w/t.**

COR-4. Complete COR and CWID all on one board. ID in eprom. Low power CMOS. ..... **only $99/kit, $149 w/t.**

COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. ..... **kit only $99, w/t only $149.**

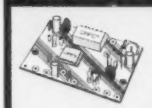
COR-5. µP controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. ..... **$379 w/t.**

AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. ..... **kit $89.**

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. ..... **kit $79.**

TD-4. DTMF controller as above except one on-off function and no toll call restrictor. Can also use for selective calling; mute speaker until someone pages you. ..... **kit $49.**

SUBAUDIBLE TONE ENCODER/DECODER



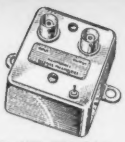
Access all your favorite closed repeaters!

- **Encodes** all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- Comprehensive manual also shows how you can set up a front panel switch to select tones for several repeaters.
- Decoder can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying buzz in receiver. ☺ **New low prices!**

- TD-5 CTCSS Encoder/Decoder Kit ..... now only **$29**
- TD-5 CTCSS Encoder/Decoder Wired/tested **$49**

LOW NOISE RECEIVER PREAMPS

LNG-( ) GaAs FET PREAMP
STILL ONLY $59, wired/tested



- Make your friends sick with envy! Work stations they don't even know are there.
- Install one at the antenna and overcome coax losses.
- *Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.*

LNW-( ) ECONOMY PREAMP
ONLY $24/kit

- Miniature MOSFET Preamp
- Solder terminals allow easy connection inside radios.
- *Available for 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, and 400-500 MHz bands.*

TRANSMITTING & RECEIVING CONVERTERS

No need to spend thousands on new transceivers for each band!

- Convert vhf and uhf signals to & from 10M.
- Even if you don't have a 10M rig, you can pick up very good used xmtrs & rcvrs for next to nothing.
- Receiving converters (shown above) available for various segments of 6M, 2M, 220, and 432 MHz.
- Rcvg Conv Kits from $49, wired/tested units only $99.

- Transmitting converters for 2M, 432 MHz.
- Kits only $89 vhf or $99 uhf.
- Power amplifiers up to 50W output.

WEATHER ALERT RECEIVER

A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts. Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!

Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; **all 7 channels** (162.40 to 162.55).

Buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. Also available factory wired and tested.

RWX Rcvr kit, PCB only $79
RWX Rcvr **kit with cabinet, speaker, & AC adapter** $99
RWX Rcvr **wired/tested in cabinet with speaker & adapter** $139

WEATHER FAX RECEIVER

Join the fun. Get striking images directly from the weather satellites!

A very sensitive wideband fm receiver **optimized for NOAA** APT & Russian Meteor **weather fax** on the 137MHz band.

Designed from the start for optimum satellite reception; not just an off-the-shelf scanner with a shorted-out IF filter!

Covers all 5 satellite channels. Scanner circuit & recorder control allow you to automatically capture signals as satellites pass overhead, even while away from home.

- R139 Receiver Kit less case $159
- R139 Receiver Kit with case and AC power adapter $189
- R139 Receiver w/t in case with AC power adapter ...$239
- Internal PC Demodulator Board & Imaging Software $289
- Turnstile Antenna $119
- Weather Satellite Handbook $20

SYNTHESIZED FM
EXCITER & RECEIVER MODULES

NEW **We recently introduced new vhf fm exciters and receivers which do not require channel crystals.**
NOW... uhf modules are also available!

Exciters and Receivers provide high quality nbfm and fsk operation. Features include:

- ***Dip switch frequency selection.***
- ***Exceptional modulation for voice and ctcss.***
- ***Very low noise synthesizer for repeater service.***
- ***Direct fm for data up to 9600 baud.***
- ***TCXO for tight frequency accuracy in wide range of environmental conditions.***
- ***Next day shipping. No wait for crystals.***

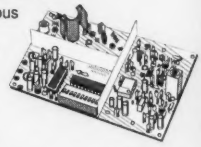
EXCITERS:

Rated for continuous duty, 2-3W output.

T301 VHF Exciter: for various bands 139-174MHz*, 216-226 MHz.

- Kit (ham bands only) ...**$109** (TCXO option $40)
- Wired/tested, incl TCXO...**$189**

T304 UHF Exciter: various bands 400-470 MHz*.



- Kit (440-450 ham band only) incl TCXO ...**$149**
- Wired/tested...**$189**

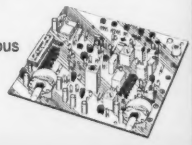
* for gov't & export use.

RECEIVERS:

R301 VHF Receiver: various bands 139-174MHz*, 216-226 MHz.

- **Kit** (ham bands only) ...**only $139** (TCXO option $40)
- **Wired/tested** ...**$209** (includes TCXO)

R304 UHF Receiver: various bands 400-470 MHz*.



- Kit (440-450 ham band only) incl TCXO ...**$179**
- Wired/tested...**$209**

TRADITIONAL CRYSTAL-CONTROLLED VHF & UHF FM EXCITERS & RECEIVERS

FM EXCITERS: 2W output, continuous duty.

- TA51: for 6M, 2M, 220 MHz ..... **kit $99, w/t $169**
- TA451: for 420-475 MHz. ..... **kit $99, w/t $169**
- TA901: for 902-928 MHz, (0.5W out) ..... **w/t $169**

VHF & UHF POWER AMPLIFIERS.
Output levels from 10W to 100W..... **Starting at $99**

FM RECEIVERS:

Very sensitive – 0.15µV. **Superb selectivity,** >100 dB down at ±12 kHz, best available anywhere, flutter-proof squelch. For 46-54, 72-76, 140-175, or 216-225 MHz. ... **kit $129, w/t $189**

- R144 RCVR. Like R100, for 2M, with helical resonator in front end..... **kit $159, w/t $219**
- R451 FM RCVR, for 420-475 MHz. Similar to R100 above. kit $129, w/t $189.
- R901 FM RCVR, 902-928MHz ..... **$159, w/t $219**

WWV RECEIVER

Get time & frequency checks without buying multiband hf rcvr. Hear solar activity reports affecting radio propagation. **Very sensitive and selective** crystal controlled superhet, dedicated to listening to WWV on 10 MHz. Performance rivals the most expensive rcvrs.

- RWWV Rcvr kit, PCB only $59
- RWWV Rcvr kit with cabt, spkr, & 12Vdc adapter $89
- RWWV Rcvr w/t in cabt with spkr & adapter $129

Buy at low, factory-direct net prices and save!
For complete info, call or write for complete catalog.
Order by mail, fax, email, or phone (9-12, 1-5 eastern time).
Min. $6 S&H charge for 1# lb. plus add'l weight & insurance.
Use Visa, MC, Discover, check, or UPS C.O.D.

See SPECIAL OFFERS and view complete catalog on our web site:
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email: jv@hamtronics.com

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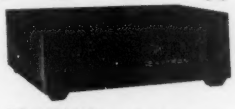
ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SWITCHING POWER SUPPLIES

	CONT.	ICS	WT.(LBS)
SS-10	7	10	3.2
SS-12	10	12	3.4
SS-18	15	18	3.6
SS-25	20	25	4.2
SS-30	25	30	5.0



SS-25M With volt & amp meters
SS-30M With volt & amp meters

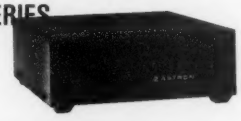
SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES



• LOW PROFILE POWER SUPPLY

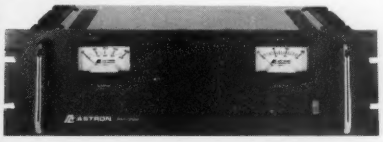
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

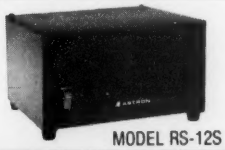
VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
VS-70M	67	34	16	70	6 x 13¾ x 12⅛	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES



MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

RAMSEY

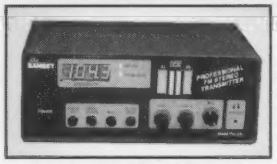
World's Smallest TV Transmitters

We call them the 'Cubes'.... Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies- that's a nickel in the picture!

Transmits color or B&W with fantastic quality - almost like a direct wired connection to any TV tuned to cable channel 59. Crystal controlled for no frequency drift with performance that equals law enforcement models that cost hundreds more! Basic 20 mW model transmits up to 300' while the high power 100 mW unit goes up to 1/4 mile. Audio units include sound using a sensitive built-in mike that will hear a whisper 15 feet away! Units run on 9 volts and hook-up to most any CCD camera. Any of our cameras have been tested to mate perfectly with our Cubes and work great. Fully assembled - just hook-up power and you're on the air!

C-2000, Basic Video Transmitter Cube.....$89.95
C-3000, Basic Video and Audio Transmitter Cube.....$149.95
C-2001, High Power Video Transmitter Cube.....$179.95
C-3001, High Power Video and Audio Transmitter Cube.....$229.95

Super Pro FM Stereo Radio Transmitter

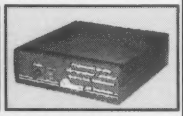


A truly professional frequency synthesized FM Stereo transmitter station in one easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set frequency easily with the Up/Down freq buttons and the big LED digital display. Plus there's input low pass filtering that gives great sound no matter what the source (no more squeals or swishing sounds from cheap CD player inputs!) Peak limiters for maximum 'punch' in your audio - without over modulation, LED bargraph meters for easy setting of audio levels and a built-in mixer with mike and line level inputs. Churches, drive-ins, schools and colleges find the FM-100 to be the answer to their transmitting needs, you will too. No one offers all these features at this price! Kit includes cabinet, whip antenna and 120 VAC supply.

We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.

FM-100, Professional FM Stereo Transmitter Kit.....$299.95
FM-100WT, Fully Wired High Power FM Transmitter.....$429.95

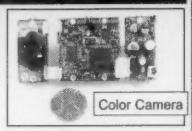
AM Band Radio Transmitter



Ramsey AM radio transmitters operate in the standard AM broadcast band and are easily set to any clear channel in your area. Our AM-25, 'pro' version, fully synthesized transmitter features easy frequency setting DIP switches for stable, no-drift frequency control, while being jumper setable for higher power output where regulations allow. The entry-level AM-1 uses a tunable transmit oscillator and runs the maximum 100 milliwatts of power. No FCC license is required, expected range is up to 1/4 mile depending upon antenna and conditions. Transmitters accept standard line-level inputs from tape decks, CD players or mike mixers, and run on 12 volts DC. The Pro AM-25 comes complete with AC power adapter, matching case set and bottom loaded wire antenna. Our entry-level AM-1 has an available matching case and knob set for a finished, professional look.

AM-25, Professional AM Transmitter Kit.....$129.95
AM-1, Entry level AM Radio Transmitter Kit.....$29.95
CAM, Matching Case Set for AM-1.....$14.95

CCD Video Cameras



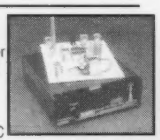
If you're looking for a good quality CCD board camera, stop right here! Our cameras use top quality Japanese Class 'A' CCD arrays with over 440 line line resolution, not the off-spec arrays that are found on many other cameras. You see, the Japanese suppliers grade the CCDs at manufacture and some manufacturers end up with the off-grade chips due to either cost constraints or lack of buying 'clout'. Also, a new strain of CMOS single chip cameras are entering the market, those units have about 1/2 the resolution and draw over twice the current that these cameras do - don't be fooled! Our cameras have nice clean fields and excellent light sensitivity, you'll really see the difference, and if you want to see in the dark, the black & white models are super IR (Infra-Red) sensitive. Our IR-1 Illuminator kit is invisible to the human eye, but lights the scene like a flashlight at night! Color camera has Auto White Balance, Auto Gain, Back Light Compensation and DSP! Available with Wide-angle (80º) or super slim Pin-hole style lens. They run on 9 VDC and produce standard 1 volt p-p video. Add one of our transmitter units for wireless transmission to any TV set, or add our IB-1 Interface board for audio sound pick-up and super easy direct wire hook-up connection to any Video monitor, VCR or TV with video/audio input jacks. Cameras fully assembled, including pre-wired connector.

CCDWA-2, B&W CCD Camera, wide-angle lens.....$99.95
CCDPH-2, B&W CCD Camera, slim fit pin-hole len.....$99.95
CCDPH-2, Color CCD Camera, wide-angle lens.....$149.95
IR-1, IR Illuminator Kit for B&W cameras.....$24.95
IB-1, Interface Board Kit.....$24.95

FM Stereo Radio Transmitters

Microprocessor controlled for easy frequency programming using DIP switches, no drift, your signal is rock solid all the time - just like the commercial stations. Audio quality is excellent, connect to the line output of any CD player, tape deck or mike mixer and you're on-the-air. Foreign buyers will appreciate the high power output capability of the FM-25; many Caribbean folks use a single FM-25 to cover the whole island! New, improved, clean and hum-free runs on either 12 VDC or 120 VAC. Kit comes complete with case set, whip antenna, 120 VAC power adapter - easy one evening assembly.

FM-25, Synthesized FM Stereo Transmitter Kit.....$129.95



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DECEMBER 1998
ISSUE #459

73 Amateur Radio Today

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Associate Publisher
F. I. Marion

Associate Technical Editor
Larry Antonuk WB9RRT

Nitty Gritty Stuff
J. Clayton Burnett
Priscilla Gauvin
Joyce Sawtelle

Contributing Culprits
Bill Brown WB8ELK
Mike Bryce WB8VGE
Joseph E. Carr K4IPV
Michael Geier KB1UM
Jim Gray W1XU/7
Jack Heller KB7NO
Chuck Houghton WB6IGP
Dr. Marc Leavey WA3AJR
Andy MacAllister W5ACM
Dave Miller NZ9E
Joe Moell KØOV
Steve Nowak KE8YN/5
Carole Perry WB2MGP

Advertising Sales
Frances Hyvarinen
Roger Smith
603-924-0058
800-274-7373
Fax: 603-924-8613

Circulation
Linda Coughlan

Data Entry & Other Stuff
Christine Aubert
Norman Marion

Business Office
Editorial - Advertising - Circulation
Feedback - Product Reviews
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On the cover: And how many hams out there have visions of *these* two sugarplums dancing in their heads? Photo of ICOM's IC-Q7A and IC-T8A handheld FM transceivers by Norman Marion. Happy Holidays to all!

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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NEVER SAY DIE

Wayne Green W2NSD/1

JY1

I was discouraged to read that His Majesty JY1 was back at the Mayo Clinic in Minnesota and still "fighting" cancer. The normal treatments for cancer are legalized torture, with chemotherapy, radiation and surgery. I wish there was some way to (a) get word to him and (b) convince him that he doesn't have to be tortured and then die. Even at this stage, which obviously is very far along, if he'd read the book by Dr. Bruno Comby *(Maximize Immunity),* which I've been recommending for several years as a book "you're crazy if you don't read," I'm convinced he could be totally well now, complete with a full head of hair instead of totally bald.

We get cancer for one reason only: We've compromised our immune system. Our bodies generate tiny cancers continually, but our immune system cleans them up for us. Then, when we weaken our immune system enough, it isn't long before a cancer somewhere is going to win and then we're in deep doo-doo. That's when we hear the two words from our doctor that we never want to hear: "Uh-oh."

The National Cancer Institute and the American Cancer Society have been doing everything they can, with the help of the AMA and FDA, to make sure that alternatives to chemotherapy, surgery and radiation are stopped from being developed or known. Hey, if we stop making ourselves sick we could stop spending a trillion and a half dollars a year — that's one and a half thousand billion dollars a year we're costing ourselves. Of course, that would put thousands of hospitals and tens of thousands of doctors out of work, and virtually wipe out the pharmaceutical and insurance industries.

Gee, tough.

So don't upset things by changing your habits and take your chemo torture like a man. Chemo and radiation both wipe out your immune system, so your first and last lines of defense against cancer are gone. Yes, the last stages of cancer can be extremely painful, but the doctors won't give you the painkillers you need for fear of losing their licenses. The needed narcotics can be addictive, you know, so the medical review boards are always on the lookout for any doctors who are prescribing narcotics, and never mind if there are good reasons.

In 1996 the Federation of State Medical Boards met in Chicago and agreed to coordinate a national network to punish any doctors who used alternative methods. For instance, there was Dr. Glen Warner, who had been using the required cancer therapies for more than 20 years at one of Seattle's largest hospitals. He left and started his own cancer institute and, using alternative therapies, had one of the best records for success of any doctor in the country. They revoked his license.

Dr. Warner said, "We have a multi-billion dollar industry that is killing people, right and left, just for financial gain … doctors, oncologists, they don't want chemotherapy to be disproved. That is where their money is."

From John Robbin's book *Reclaiming Our Health:* "… the vast majority of studies show that radiation cannot cure cancer, and that it can rarely extend life for people with the disease … the truth is that, for more than 90% of people with cancer, chemotherapy had next to nothing to offer … oncologists say that they would not allow chemotherapy to be given to themselves or their families … oncologists characteristically downplay the level of suffering involved with chemotherapy.

The chief chemotherapist at the Mayo Clinic admitted in a published paper that he gave chemotherapy to cancer patients which he knew would not help them, right up to their deaths, in order to keep them from trying alternative therapies.

No, it is not easy to change a lifetime of eating habits, but as you eat you should be aware of what's ahead. And not even the wealth and power of a king will be able to save you from what you've done to yourself.

Hear Wayne Talk!

On my way to a short Aspen ski vacation I'll be stopping off in Denver to give a talk. I hope you can make it. It'll be at the Airport Embassy Suites, January 5th at 7 pm. Yes, it's free. So what'll I be talking about? The same things I write about in my editorials — amateur radio, your health, how to make money, and so on. Or, for that matter, anything you ask about. This'll give me an opportunity to meet you personally, and maybe answer some questions for you.

At the recent Peoria hamfest one chap asked me if the universe is expanding or not. The preponderance of evidence indicates that it isn't, that it's a steady-state universe.

If you're planning to come it would be most helpful if you'd let me know so I won't try to fit a hundred people in a 20-person meeting room.

How About Skiing?

I'll be skiing at Aspen January 6–11 and I really hate to ski alone. It's a lot more fun to be with some others on those chair rides, and to share the incredible excitement of whooshing down the slopes at breakneck speed. I love it. The English language is the pits when it comes to explaining emotions like that.

And it's fun to go to the many superb Aspen restaurants with friends. And talk. If you can get away for a few days, this is the low season time at Aspen, right after the New Year's holidays, so the slopes are relatively open and the lift lines normally zilch. I hope the weather cooperates. Last year it snowed all but one day during my visit, which took the fun out of it, reducing the visibility to inches. I like to see where I'm going and get there fast rather than feeling my way along.

Yes, of course I'll have an HT in my pocket tuned to the local repeater.

Scramble

The Kachina, featured on our August cover, seems to have left the rest of the ham industry in the dust, scrambling to catch up. I think we've now seen a good preview of what our top 21st century ham rigs will look like. Well, it only makes sense to marry our rigs and computers. After all, our rigs have been increasingly computerized with frequency synthesizers and digital signal processing, so the move to a knobless rig that's 100% computer-controlled is an obvious next step.

I'll bet the engineers in To-

kyo and Osaka are working overtime to catch up with this American-made evolutionary product.

If you're fortunate enough to get a Kachina, let's hear how it's doing for you. With the sunspots perking away, opening our DX bands for more and more hours a day, let me know what goodies you've dug out of the pileups. Oh yes, if you luck into a truly interesting contact, please make a note of it and let me know the details. I keep fantasizing that such a thing is possible, but I need some sort of evidence to prove this isn't just another W2NSD/1 fantasy.

Skills

Talk about fuzzy thinking! The FCC believes we should have several license classes to "to encourage amateur operators to advance their skills." Skills have never been developed by memorizing a Q&A manual — they're built by doing, so the whole idea that different classes of licenses will build skills is really dumb. It's a crock.

If you want to build your packet skills you get involved with packet. Ditto satellite communications, fox hunting, and all of the other fun facets of our hobby. Unless you're too damned lazy.

Which is why I think that having more than one license class is a holdover from the pre-war ham days when a Class A license permitted you to operate in the two narrow phone bands on 75 and 20m. In those AM days there was room for about nine round tables and that was that, so it was necessary to make it more difficult to get the privilege. Well, that was 1940 and now we're going on 2000, and it's about time our regulations were tailored to meet today's world instead of one a few old-timers like me remember.

It's nice that the ARRL grudgingly has proposed that we cut back to only four license classes. Only? Lordy!

I'd like to see this whole class business junked. Then I'd like to see a lot more articles telling our somnolent brethren how much fun you're having on 6m, with slow scan, and so on. Fan the flames of interest. Tell 'em what fun you're having on our ham satellites. Show us some of the stuff you're doing on slow scan.

How about getting your club to start putting together some videos showing what can be done with moonbounce, with fox hunting, and so on. I'll be glad to help make copies for other clubs to show at their club meetings. We desperately need to get some life into club meetings. So how about producing some 20-minute or half-hour ham videos which will help get a few hams off dead center?

What's happening down on 160m these days? Do a video. Next summer, how about a video of your club's Field Day effort? Don't tell me your members don't have video cameras — so get busy. You could do some great videos of fox hunts. How about one on getting on RTTY?

Clubs go on DXpeditions every now and then. So when's the last time you saw a video report made available for other clubs to enjoy? A video could include both video and slides.

We build our skills by doing things, so let's get rid of our many classes and get busy encouraging hams to get involved with new modes and bands, which really will help build their skills.

Unlimited Memory

Yes, I know, I've written about memory before, but since (a) there are some new readers and (b) your memory of what I've written is probably approaching zilch, let's walk through all this again.

Firstly, scientists don't know where our memory is stored. Oh, they know if they poke an electrode into the brain about here they can stimulate a specific memory. But that's like sticking a test prod into a telephone switchboard.

If you've read much about the brain you know that we have had people who've survived accidents which destroyed around 90% of their brain with no loss of their memory or other functions. Worse, other people have also lost 90% of their brains, but another 90%, and they're doing just fine, too. We don't seem to have any limit to how much we can learn. Our memory, unlike that of our computers, seems completely unlimited. Not that possible memory limitations are much of a potential problem for most people. They read (but not much) and they forget most of what they've read.

Inputting Data

Reading makes it possible for you to get your information from the most knowledgeable people in the world. It's a direct line. It's also an excellent source of strongly held, but unfounded, opinions, so you have to be picky about what you accept as valid data.

Most of us are taught to read in school. But just barely. A growing percentage of our graduates, even from college, are virtually illiterate. Lordy, I wish you could see some of the letters I get!

Reading is a skill and as such it can be improved by you forcing yourself to read faster and faster. But you have to push. It's the same as with running or swimming. You get better at skills by pushing yourself and then pushing harder. The really great thing about reading faster is that the faster you read, the more you retain of what you've read.

Until, with your help, I can get our educational establishment to start producing outstanding educational videos that will teach all of the K–12 subjects in a fraction of the usual time, and make the material available anywhere the

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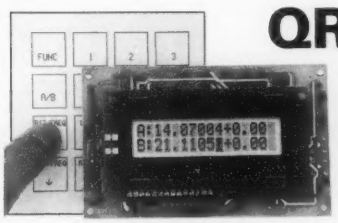

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LETTERS

From the Ham Shack

Richard Thompson, Abilene TX. I'm hoping that the readers of *73 Magazine* can help me with some research that I'm carrying out. I'm working on a book on the development of quartz-crystal-controlled communications during World War II.

As I'm sure many of you know, the Army waited until 1940 to decide to switch to crystal-controlled radios. At the time, they felt that since we weren't in a war, the handful of companies manufacturing quartz crystal units (QCUs) could handle the demand. Well, in another year, we *were* in the war, the demand for QCUs was far beyond what they'd estimated, and there was no way that the current crystal industry could handle the job.

The response by the Army was to form the Quartz Crystal Section, under the Signal Corps, whose job it was to develop mass production techniques for QCUs and then to find the manufacturers to produce them. A small group of civilians (geologists, engineers, and physicists) literally created an industry from scratch. A second problem that developed after the industry came on line was the "aging" problem with crystals: a mysterious increase in the natural oscillating frequency after a short time in the field. The physicists at the Signal Corps Lab in Ft. Monmouth, New Jersey, were called on to find the reason behind this problem and develop a solution, which they did.

For my book, I'm looking for first-person accounts of these events. I'm interested in two major areas: 1. I would like to make contact with anyone who may have worked in the crystal industry at this time and who would know something of what it took for this industry to be created, or a ham who might know something about the state of the art in crystals at the beginning of the war; and 2. Any military veterans (especially Army Air Corps) who might remember the effects on communications of first, the shortage of crystal units at the beginning of the war; and second, the problems caused by the aging problem (one of my sources who worked in the Quartz Crystal Section speaks of an urgent telegram to the Pentagon from Gen. Eaker of the 8th Air Force complaining of a serious problem with communications and strongly urging that a solution be found).

Any B-17 radiomen out there? I would love to hear what you have to say. I can be contacted at the following address:

Dr. Richard J. Thompson, Jr.
McMurry University
McM Station, Box 38
Abilene TX 79697
Phone: (915) 793-3875
E-mail: [rthompson@mcm.edu]

How about it? Let's dust off some memories! — Ed.

John G. Boles KA6LWC. I would like to comment on a recent "QRX" article in the October 1998 issue of *73 Amateur Radio Today*, "What to Do About Your Technician Accent" by Bill Smith N2SZW.

In the second paragraph, he mentions not to use the word "clear" when nobody replies to the announcement one is on frequency. This is a "territorial" issue, because in many areas, it indicates that the operator is leaving the local frequency and is not monitoring the repeater, thus ending his communications or attempted communications. In the second paragraph from the bottom, beginning "Avoid endless ...," he proceeds to state that the use of "clear" is acceptable to end a communication. This appears to be a contradiction because when one leaves the local frequency, there's an end to communications and monitoring.

Another issue: The letters PTT have often been used to indicate *Push To Talk*. If you think about it, it really means *Push Think Talk*. The "think delay" allows transmitters and repeaters time to get into the transmit mode so that the first words are not cut off.

I notice that "QRX" has no E-mail address for responses, nor is there any E-mail address for *73 Magazine*. It would be helpful to note any E-mail addresses available on a separate column/masthead.

Actually, 73's E-mail address is on the "Table of Contents" page and is the same for all Departments: [design73@aol.com]. — Ed.

Ned Stevens K7ELP, Murray UT. I really enjoyed the article "What's the Scoop on the Lazy Loop?", by WA2UGT in the September 1998 issue. Besides being very interesting to me it was timely as I was in the process of deciding what low-band antennas to install at this QTH. It sure proves the more wire you have in the air the better you will do.

This article reminded me of an experience I had some 30 years or so ago. I was on active duty with the US Coast Guard, stationed at Lualualei, Hawaii (northwest section of the island of Oahu, a few miles from Honolulu). I was in charge of a communications station transmitter site. We were having some difficulty in communicating with our ships in the northwest Pacific Ocean. At the time all our transmitting antennas were either conical monopoles or an occasional quarter-wave wire vertical. The conical monopoles were broadbanded, as I recall. They were operated from about 4 MHz to 16 MHz. The site had enough space for a longwire antenna so we built a horizontal V antenna, with the vertex pointing to the location of the ships. We made each leg four wavelengths long at the 16 MHz frequency. We used a small ham CW transmitter tuned to 16 MHz to tune the antenna. As I recall, the transmitter was an AT1. We were fortunate, as the feedpoint of the antenna turned out to be 200 ohms. We then made a quarter-wave balun out of the large coaxial cable we used for transmission line. The coax was 50 ohm but about one inch in diameter. This antenna improved the signal to the ships by a tremendous amount, as the communications went from marginal to Q5 at both ends. Something in my memory tells me that we designed the V antenna for the radiation angle for the distance that we were transmitting.

Rich Mollentine WAØKKC, Shawnee Mission KS. Ham radio is a hobby, but on occasion some take it as an obsession—to the detriment of their family and friends. It's like anything else: It should be balanced with the other things of life. Many an XYL will question why we spend 24 hours straight in a contest talking to strangers in Borneo or Pago Pago but have no time for *them*.

Balance your hobby with your other family obligations. 73

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QRX . . .

Who's Your Hero?

Each year the ARRL honors four dedicated ham radio instructors, teachers, and recruiters. Clubs or individuals are asked to complete a nomination form for the nominees. More information about the awards can be found at [http://www.arrl.org/ead/award/]. If you do not have Internet access and would like a nomination form, please contact Jean Wolfgang WB3IOS at (860) 594-0219, in the ARRL Educational Activities Department.

Nomination forms must then be sent to your ARRL Section Manager before January 31, 1999. A list of ARRL Section Managers is available at [http://www.arrl.org/field/org/smlist.html] or can be found on page 12 of any *QST*.

Ham Astronomer Honored

James Moran K1AKE, of Concord, Massachusetts, has been elected to the prestigious National Academy of Sciences, one of 60 new members announced last April 28. Moran is a radio astronomer at the Harvard-Smithsonian Center for Astrophysics and a professor at Harvard University. He is best known for his application of the techniques of Very Long Baseline Interferometry to the study of astronomical masers.

From the ARRL, via *Newsline*, Bill Pasternak WA6ITF, editor.

Hams Serve in Times of Natural Disaster

Ham radio was on the scene as flash flooding hit Mexico City on Monday, September 28th. Five people died and thousands were left homeless after mudslides unleashed by weeks of heavy rain buried homes in the Mexican capital and left entire suburbs under water.

The storms and mudslides knocked out utilities and telephone service to the affected parts of the city. According to news reports, ham radio operators stepped in to provide lines of communications for search-and-rescue groups and relief authorities. They also worked at warning the people of the dangers in the area and gave basic recommendations to avoid danger.

Ham radio operators in the Balkans were also on the spot with reports as a tremor rocked Belgrade and central Serbia. The quake, which measured 5.4 on the Richter scale, rocked the area early on Wednesday, September 30th. It caused minor damage in the center of Belgrade, knocking out power and telephone service in parts of the city.

Reports from amateur radio operators said people in the area had run from their homes in their nightclothes, clutching their children. The reports said that rubble from one building did crash into a city street, but nobody was injured. A ham in the town of Valjevo reported slight damage there, as well.

From *VHF Reflector*, published news reports, via *Newsline*, Bill Pasternak WA6ITF, editor.

Yet Another Visit from You Know Who

'Twas the night before Christmas, and all through two meters,
Not a signal was keying up any repeaters.
The antennas reached up from the tower, quite high
To catch the weak signals that bounced from the sky.
The children, Tech-Pluses, took their HTs to bed,
And dreamed of the day they'd be Extras instead.
Mom put on her headphones, I plugged in the key,
And we tuned 40 meters for that rare ZK3,
When the meter was pegged by a signal with power.
It smoked a small diode, and, I swear, shook the tower.
Mom yanked off her phones, and with all she could muster
Logged a spot of the signal on the DX Packet Cluster,
While I ran to the window and peered up at the sky
To see what could generate RF that high.
It was 'way in the distance, but the moon made it gleam—
A flying sleigh, with an eight-element beam,
And a little old driver who looked slightly mean—
So I thought for a moment it might be Wayne Green!
But no, it was Santa, the Santa of hams,
On a mission, this Christmas, to clean up the bands.
He circled the tower, then stopped in his track,
And he slid down the coax, right into the shack.
While Mom and I hid behind stacks of *CQ*,
This Santa of hamming knew just what to do.
He cleared off the shack desk of paper and parts,
And filled out all my late QSLs for a start.
He ran copper braid, took a steel rod and pounded
It into the earth, till the station was grounded.
He tightened loose fittings, resoldered connections,
Cranked down modulation, installed lightning protection.
He neutralized tubes in my linear amp—
Never worked right before—now it works like a champ!
A new low-pass filter cleaned up the TV;
He corrected the settings in my TNC.
He repaired the computer that would not compute,
And he backed up the hard drive and got it to boot.
Then he reached really deep in the bag that he brought
And he pulled out a big box. "A new rig?" I thought.
"A new Kenwood? An ICOM? A Yaesu, for me?!"
(If he thought I'd been bad it might be QRP!)
Yes! The Ultimate Station! How could I deserve this?
Could it be all those hours that I worked Public Service?
He hooked it all up, and in record time quickly
Worked 100 countries, all down on 160.
I should have been happy—it was my call he sent,
But the cards and the postage will cost two months' rent!
He made final adjustments, and left a card by the key:
"To Gary, from Santa Claus. Seventy-three."
Then he grabbed his HT, looked me straight in the eye,
Punched a code on the pad, and was gone—no good-bye.
I ran back to the station, and the pileup was big,
But a card from St. Nick would be worth my new rig.
Oh, too late—for his final came over the air.
It was copied all over. It was heard everywhere.
The ham's Santa exclaimed what a ham might expect:
"Merry Christmas to all, and to all, good DX!"

From *Squelch Tale*, Dec. 1996, newsletter of the Chicago FM Club, Inc., Timothy M. Garrity WD9DZV, editor.

Sorry, but we don't have a clue who Gary is (assuming Gary is the author of this year's parody), or we'd definitely have given him credit.—Ed. 73

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Hugh Wells W6WTU
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Being a ham, you're expected to know everything about electronics regardless of the application. So have you ever had some neighbors drop over and indicate that they needed your help with their car? Chances are, they've indicated that it won't start or runs poorly, or that the battery is dead.

In most cases, the symptoms described seldom fit the actual situation. But because you're a ham, you're looked upon to be "the neighborhood electronics resource." So how do you approach the problem?

Do you agree to take a look? Or do you shine them on and suggest that they go see the local mechanic? Let's assume that you're at least willing to take a look at the problem to help sort out the details, which may lead to a solution if the problem is electrical. And if it's mechanical, you may have to suggest the mechanic after all.

Electrical problems and solutions in older cars were usually easy to sort out, but the computers used in modern cars make the problems more difficult for a ham to diagnose. In fact, the things that one might be able to do are limited to only a few things, but those could have an identifiable solution within your grasp.

Three situations are discussed here that can help solve many aggravating problems that cars experience and are not under computer control. These situations involve the spark plugs and HV wiring, alternator and battery, and current leakage paths that run a battery down unexpectedly. The test equipment for troubleshooting these three situations is typically available on a ham's workbench: oscilloscope; digital voltmeter/ammeter; and #1157 (or #1034) taillight bulb. So there is very little financial investment required, beyond what a ham normally has available.

Most hams have had some exposure to Ohm's law problems as part of their electronics training. The logic and circuitry involved in Ohm's law problems is exactly the same as that required for solving electrical problems in a car's electrical system. Troubleshooting then becomes a matter of developing a plan or procedure to follow in sorting out the various measurements and symptoms.

Spark plugs

Being able to diagnose a problem in an automobile's high voltage ignition system is both interesting and satisfying. Because of the pulse nature of the system, it can be analyzed dynamically. Using an oscilloscope provides a means of looking at the HV pulses for one or all of the cylinders. Observed conditions can be related to inequality of spark, weak spark, shorted spark plug, defective plug wiring, or intermittent plug firing.

In the case of a standard ignition system (points and capacitor), the point's dwell time can also be observed to determine if coil saturation is being achieved. Dwell time is not a factor in electronic ignition systems. The oscilloscope display can be focused for detailed analysis on one or all of the spark plugs to help sort out differences between them.

To make up an engine analyzer using an oscilloscope, it will be necessary to make up a couple of interface boards to be used as scope probes as shown in **Figs. 1** and **2**. Sync for the horizontal of the scope is obtained from the high voltage using the circuit shown in **Fig. 1**. A wire cuff or broadfaced spring clip is used to provide a capacitive coupling to the HV wire, as a direct connection is not desirable. The circuit integrates the HV pulse to create a single con-

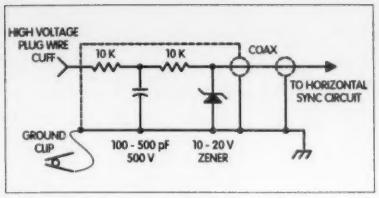

Fig. 1. Sync input circuit.

stant amplitude (a zener diode is used as an amplitude limiter) trigger pulse suitable for synching the scope.

The HV pulse train to be analyzed is obtained from the primary side of the ignition coil using the circuit shown in **Fig. 2** and is applied to the vertical input of the scope. All HV sensing is done in the primary of the coil, not in the actual HV circuit. All of the system's performance is viewable in the primary more so than in the secondary, or HV side, of the coil. A small amount of integration is performed by the interface board, but only enough to make the pulse visible on the screen.

The amplitude pot is used to bring the vertical signal amplitude within the control range of the scope's input attenuator. The pot remains fixed after the initial adjustment. In modern engines, there is a separate ignition coil for each pair of cylinders. Therefore, it will be necessary to move the vertical scope probe from one coil to another to view the next pair of cylinders.

Construction of the probes indicated in **Figs. 1** and **2** is not critical. Some shielding is recommended to keep stray signals from entering the scope, but even unshielded boards have been used successfully. The minimum construction should entail placing each circuit within a plastic box to prevent the circuit from shorting to an engine component.

Test preparation includes connecting the interface circuits to and starting the engine, and running the engine at idle. In operation, the scope sweep is adjusted to approximately 20 ms/cm when displaying all of the plugs at once. Attaching the HV pickup (sync) to plug #1 will allow all of the plugs to be viewed in the order in which they fire (only when one coil is used for all of the cylinders).

Adjust the sweep timing to display four, six, or eight pulse sequences as

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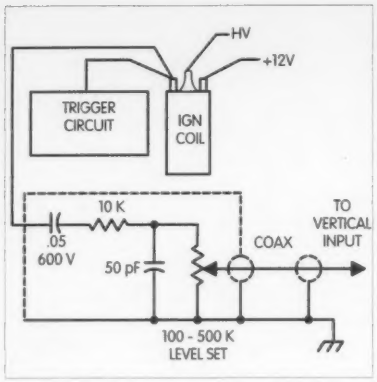

Fig. 2. Pulse input circuit to vertical amplifier.

determined by the number of cylinders present (only two cylinders at a time can be viewed when an ignition coil is provided for each pair of cylinders). To view a single plug, attach the HV pickup to the plug to be viewed and adjust the sweep to approximately 1 ms/cm or until one pulse sequence is observed. Move the HV pickup from one plug wire to another to make pulse comparisons.

Typical waveforms suitable for comparison are shown in **Fig. 3.** Because the waveforms obtained vary somewhat from one engine to another, it is necessary to identify a "norm" waveform for the engine being analyzed. A norm can be determined by looking first at all plugs firing (typical sweep of 20 ms/cm) and observing the similarity as a norm. Then note any differences in the plug patterns observed for a potential problem. Obtain a closer analysis of individual plugs using a sweep of about 1 ms/cm to provide clues as to the health of the ignition system.

To aid in the analysis, look for the series of HV pulses that occurs during a plug firing, then look for the short delay before the next firing. The right-hand end of the delay indicates the beginning of the firing cycle and the left-hand end of the next delay indicates the completion of the firing cycle.

The pulse waveform between the delay periods provides the clues for comparison to the examples shown. A shorted plug wire can be simulated by holding a screwdriver between the engine block and the top of a spark plug while observing the waveform. It is *not* recommended, however, to simulate an open HV wire by removing a plug wire—as electronic ignition systems are subject to damage when an open HV wire occurs.

Alternator and battery

Troubleshooting a battery and/or alternator problem is fairly easy with a digital voltmeter, and the short time that it takes could satisfy your neighbors and make you a hero. The use of a digital voltmeter is preferred, but an analog voltmeter will work with a little less satisfaction in determining specific voltage values. But the general function of "what's happening" can be displayed with an analog voltmeter.

Test conditions involve the logic of what happens during static and dynamic conditions where static conditions occur when the engine is turned off. During this period both loaded and unloaded tests can be performed on the battery to determine its present health regarding being charged or discharged.

What you may not know at this time is whether the battery has been charged recently or discharged due to an inadvertent current leakage path. But the first test involves performing a load test which begins by placing the voltmeter across the battery terminals and noting the voltage indication, which should be approximately 13.5 V. While observing the meter, the headlights are turned on. Typically, if the battery is healthy, the voltage indication will remain above 12.6 V and the lights will be fairly bright. The small voltage drop between the load and no-load test indicates the battery to be healthy. If the battery has not been charged recently, perhaps if the alternator has failed, then the voltage differential would be higher—making the battery suspect. But before installing another battery, the alternator will require testing. Because the battery and alternator together make up the power system for the automobile, they must be tested as a system.

Test conditions

I.A. To determine if a battery is capable of starting the engine, you need only to engage the starter. Assume first that the solenoid just clicks, with the starter failing to turn. This indicates one of three conditions:

1. The battery charge is low.
2. The battery is defective.
3. The starter is defective.

B. Two tests are required for an evaluation of the battery, because if the battery is good and the solenoid still just clicks, then the starter is suspect. The starter and solenoid are both suspect if the battery is fully charged and the solenoid fails to click. The first test of the battery involves measuring the terminal voltage under load (headlights *on*) with the engine *off*. Record the voltage readings. Then, after charging the battery, the load/no-load tests are repeated and the voltage values compared.

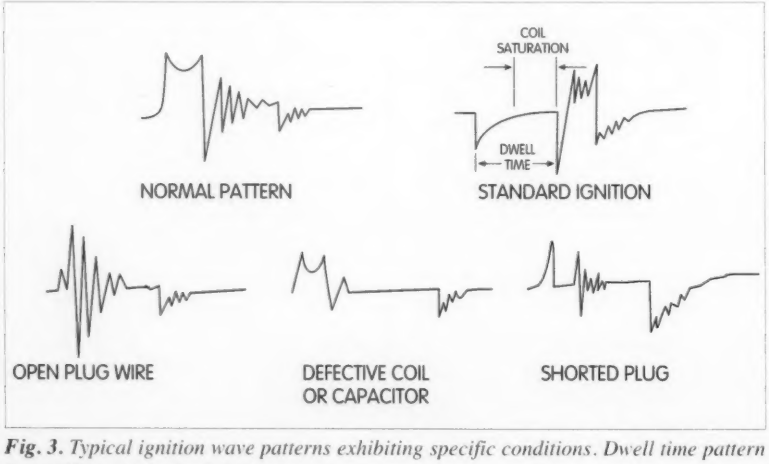

Fig. 3. Typical ignition wave patterns exhibiting specific conditions. Dwell time pattern is specific to a standard ignition system.

C. Expected results:

1. If the battery will retain a charge, the terminal voltage will be above 12.6 V for both load and no-load tests.

2. If the battery terminal voltage is below 12.6 V after being charged, then the battery is suspect, as it may be defective.

II.A. Determining the status of an alternator is much easier and considerably faster than testing a battery. Alternator testing is always done with the engine running. With one exception, the engine should not be running when checking for alternator diode leakage.

1. To perform a diode leakage test on an alternator, the following procedure is used. With engine off, the battery cable is removed from the alternator and a voltmeter is placed between the terminal and the cable. Because of the high reverse resistance of the diodes, a voltage indication of less than 12.8 V should be expected. If the leakage is more than might be expected, a #1157 (or #1034) light bulb with pigtails attached to one filament may be placed between the cable and terminal as an additional test method. The light bulb should not exhibit any filament glow. If the bulb filament does glow, then suspect leaky diodes in the alternator. Another symptom of a bad alternator/regulator (particularly if the filament glows during the light bulb test) will be a dead battery after a few hours of non-use.

2. Dynamic tests on the alternator will also check the regulator, brushes, and diode conduction. The terminal voltage across the battery with the engine running at or above idle should yield a voltage between 13.2 and 14.7 V. The voltage value should remain approximately the same whether or not the headlights are turned *on*.

B. Expected results:

1. If the terminal voltage remains fairly constant at a value between 13.2–14.7 V with or without a load, then the alternator and regulator are functioning OK.

2. If the terminal voltage is at 12.8 V or below with or without a load, suspect the alternator/regulator as being defective.

3. If the voltage appears to be regulated but hangs at about 12.7 V, then suspect an open diode in the alternator.

C. **Table 1** provides a guide for making diagnostic decisions regarding an automobile's electrical system. Because of the cost factor of replacing a battery or alternator, replacement decisions should be based upon as many symptoms and available test data results as possible. It is best to perform all of the tests and compare the results of each to identify the bad component.

VOLTAGE	CONDITION
15.2	Overcharging
13.2 – 14.7	Normal Range
13.0	Not Charging
12.7	Possible Open/Defective Diode
11.5	Low Battery

Table 1. *Expected battery terminal voltage values based upon typical system conditions.*

III.A. One of the most difficult electrical problems to diagnose is a current leakage path that tends to run down the battery during a short period of unuse—24–48 hours, perhaps. Because of the elusiveness of the problem, only a few hints can be provided as to how you would go about solving it. Hams have a solution for almost all electronic problems, even those involving cars. The best suggestion is to consider the car's electrical system as an Ohm's law problem in which there is one voltage source feeding a great number of parallel current paths. It will then be necessary to determine the current flow in each path when each is intended to be *open* circuited.

B. Before starting a troubleshooting process, make sure that all lights including the glove box, trunk, engine compartment, map light, etc., are turned off. It may be necessary to temporarily remove them from their sockets to make sure they are completely turned *off*. It's also a good idea to remove the cigarette lighter from its socket. It must be recognized that the clock and computer will draw some current, but the value should be relatively small in comparison to what a glove box light might draw.

C. The first step in chasing a leakage problem is to determine the magnitude of the leakage path. This can be done by removing the battery cable from the battery. This operation can wipe out the theft code on some electrical devices, such as the radio, within the vehicle, so you must be prepared to re-enter the proper codes following the troubleshooting process. Otherwise, do not remove the battery cable from the battery.

D. Assuming that the above items have been accounted for and found to not be a problem, a DVM and a #1157 (or #1034) light bulb can be used as diagnostic tools for tracing current paths.

1. Remove the battery cable and place the light bulb between the cable and battery terminal. If the bulb filament glows, then take note of the brilliance as a reference for later measurements. Place a DVM set on the amps scale and measure the current value. Anything greater than about 50 mA is considered suspect. The measured value is essentially the current value that must be traced to the suspected branch circuit causing the leakage path. It is assumed here that the alternator and regulator have been found to be OK and checked as in step number II above.

2. Circuits that do not normally go through the fuse block are the headlights, computer, transmission shift indicator, temperature sensors, starter, alternator, etc. If no problem is found in the fuse block test (below), then each of these circuits will require an examination. Each of the circuits listed will have a switch or relay that provides power to the circuit. It will be necessary to examine each.

3. Reconnect the battery cable to the battery and move to the fuse block. Each fuse is to be removed, one at a time, and the current measured in that path. Either the light bulb or ammeter may be used as a current indicator.

E. Expected results:

1. The current in each circuit path should be zero if the circuit is open.

2. The circuit containing the high

Continued on page 23

Announcing the QRPeanut

Here's a compact QRP transmatch you can build for next to nothing.

James P. Fisher N5GZH
P.O. Box 856
Kyle TX 78640

When I was faced with the need for a cheap and compact matching unit for portable, low-power operation, it soon became clear that my options were limited. Available units, I found, were larger than I needed for QRP. And besides, who needs an ATU rated at 200 watts when you're camping or backpacking on batteries at only five? Enter the forgiving beauty of QRP and a simple solution! Low voltages encountered at QRP power levels make ATUs easy to home-brew. And as they say about traveling, "Gettin' there is half the fun." Hence the QRPeanut.

Design and building details

Design of the QRPeanut is a straightforward adaptation of the classic T network as described by Doug DeMaw and others. The chief advantage of this design is its obvious simplicity (see **Fig. 1**). On the down side, it has a "high-pass characteristic," which means that it won't filter out spurious harmonics. However, if your QRP signal is clean to begin with, this shouldn't matter much.

I made L1, L2, and L3 from #22 enamel wire wound on toroids (Amidon T80-2 for L1 and L2, T80-6 for L3), chosen for low loss and compactness. (Toroids are easy. I would rather wind 10 of them than one of those cylindrical things.) The coils are center-tapped and mounted on a "one size fits all" type of circuit board from Radio Shack. After soldering, it's not a bad idea to check connections for DC continuity, since residual amounts of the wire's enamel coating will sometimes produce a bad solder joint.

Size and type of enclosure are mostly up to the builder, but the front panel should be nonmetallic for reasons I will explain later. I built mine in a five-inch by two-and-a-half-inch by two-inch ABS plastic box (Radio Shack 270-1803). *Important tip:* Unless you have the hands of a neurosurgeon and the patience of Job, wiring the rotary switch in place with a box this size will be nearly impossible. If compactness is your goal, consider wiring the toroid board to the rotary switch on a simple "jig" (see **Photo A**). Radio Shack was kind enough to package this line of enclosures with both a plastic lid and one made of aluminum sheet. I made my jig by drilling mounting holes for C1, C2, and the rotary switch and then adding a right angle bend roughly one-half-inch wide for a foot. This allowed me to mount the jig on a small block of wood with screws, forming a stable base on which to work. The completed assembly was then removed from the jig and eased into the enclosure with a little wire bending where appropriate.

The stiffness of the wiring is probably enough to hold the board in place. I used a lump of Coax Seal® as additional insurance. An inductance meter is also handy for checking to be sure

Continued on page 16

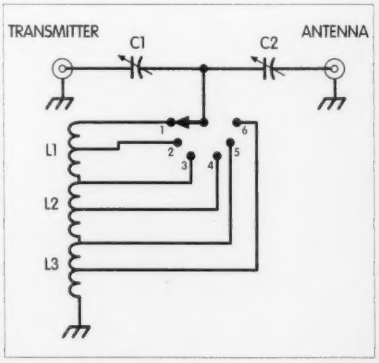

Fig. 1. Schematic.

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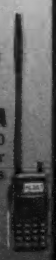

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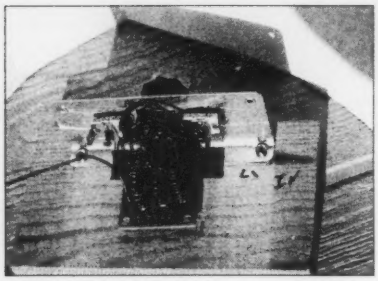

Photo A. The wired ATU on the assembly jig.

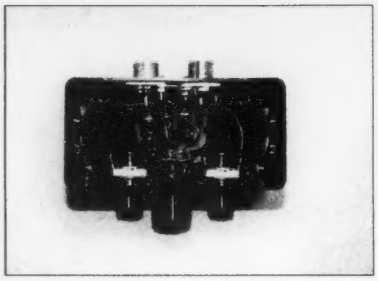

Photo B. Top view.

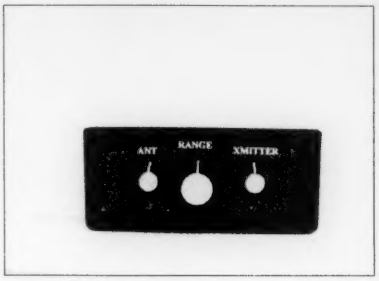

Photo C. Front view.

the rotary switch and toroids are wired correctly.

Since the affordable, air-spaced variable capacitor seems to be going the way of the dinosaur, I chose to use a type of mica compression trimmer having a built-in shaft (ARCO S463). There are tradeoffs. The S463 is a bit quirky; operation is not linear, and the metal shaft is electrically common with one side of the capacitor. *Do not attempt to use these capacitors mounted directly to a conductive panel*. They seem to work fine mounted on plastic and with plastic knobs. Since the single mounting screw is also "hot," use nylon hardware or simply tape over it. (Did I mention the beauty of QRP?) All in all, a small price to pay for components that are compact and cheap.

Choose your favorite flavor of coaxial connector, but since the chassis is plastic, it's a good idea to strap the ground sides together with a bus. I used SO-239s for universality. You may want to build even smaller.

A couple of last tips about those cheap but quirky capacitors. For reasons unknown, shaft diameters are a hair larger than one-quarter inch, so it may be necessary to drill the knob collars to a slightly larger size; 17/64-inch is about right. Hold them for drilling by making a hole in a piece of wood in which the knob will fit snugly. Also, giving the adjustment screws at the back of the capacitors a squirt of contact lubricant (I used Caig DeOxit®) makes operation smoother and should improve service life.

Remember when operating that most of the range of the capacitors is in the last two clockwise turns. Other than that, the QRPeanut works like any other transmatch. 73

Parts List

C1, C2	ARCO S463*
L1	28 turns #22 enameled wire on Amidon T80-2 core, center-tapped
L2	24 turns #22 enameled wire on Amidon T80-2 core, center-tapped
L3	18 turns #22 enameled wire on Amidon T80-6 core, center-tapped
Rotary switch	2-pole, 6-position, RS #275-1386, cut shaft to 5/8"
Toroidal cores	2 ea. Amidon T80-2 (red) 1 ea. Amidon T80-6 (yellow)
Circuit board	RS #276-159
Enclosure	plastic, 2"x2-1/2"x5"

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Table 1. Parts list.

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Keys to Better Operating

Yes, much of it is *common sense …*

Bob Shrader W6BNB
1911 Barnett Valley Road
Sebastopol CA 95472
[w6bnb@aol.com]

There is a proper way of operating radio transmitters on the air to produce the most efficient and interesting communications. The basic rules are reasonably simple. They are things with which you will probably agree if they are considered a bit. The undesirable operating items discussed here have all been heard recently on the ham bands. Let's not be the ones who operate that way.

It might be said that the cardinal requirement in any communicating, whether by telephone, by computer, by RTTY, by SSB/AM/FM radiotelephone, or by radiotelegraphic CW, is to make sure that all of the information transmitted is received by the receiving operator. Actually it is up to both the receiving operator and the transmitting operator to do everything possible to ensure that this cardinal requirement is met.

The emphasis here will be on phone and CW operating. One of the things that can interfere most with receiving all of the information sent is speed. If transmission speed is faster than can be received correctly, regardless of the means used to do the communicating, all of the desired information will not get through.

Radiotelephone operating

The basic theory behind calling another station is to attract the attention of the station to be contacted (usually by calling CQ) and then advise who is doing the calling. Using voice communications, if two stations know each other well, the desired station's callsign can be transmitted, followed by "This is," then the callsign of the calling station, probably transmitted only once.

When stations are not known to each other too well, if at all, the called station's callsign can be sent once (maybe twice), then "This is," and then the calling station's callsign, first with regular spoken letters and then repeated phonetically. If conditions are not good, callsigns may have to be repeated more than this.

There have been many different "phonetic alphabets" used in amateur radio. Some used names, some used cities, some used states or countries, and some were just supposed to be witty. Today the generally accepted international phonetic alphabet is:

Alfa	**N**ovember
Bravo	**O**scar
Charlie	**P**apa
Delta	**Q**uebec
Echo	**R**omeo
Foxtrot	**S**ierra
Golf	**T**ango
Hotel	**U**niform
India	**V**ictor
Juliett	**W**hiskey
Kilo	**X**-ray
Lima	**Y**ankee
Mike	**Z**ulu

Table 1. *Internationally recognized "phonetic" alphabet.*

A suggested pronunciation of the 10 numbers to make them more distinguishable when spoken might be:

1	Wun-uh
2	Too-uh
3	Thu-ree
4	Fo-wer
5	Fy-yiv
6	Sicks
7	Seven
8	Ate
9	Ny-yun or Nine-er
0	Zee-row (not "Oh")

Table 2. *Pronounce the numerals so there can be little possibility of confusion.*

As an example of the use of phonetics, suppose you want to call an amateur station with a call such as "VE3BCG." Since this call is made up of all "eee" sounding letters and numbers, unless very carefully enunciated, some of the letters could easily be misunderstood. If spoken as "Victor Echo Thu-ree Bravo Charlie Golf," there is little chance of receiving the letters incorrectly.

Clarity

Clarity is one of the things which can interfere with the cardinal requirement of phone-type operation. Received signals may not be understandable if the transmitting operator is not using the microphone properly, if the modulation circuits are not functioning properly, if the microphone gain control is not set properly, if words are mispronounced, or if the person doing the talking does not enunciate clearly.

Microphones can be misused. There is always a certain amount of noise generated in audio circuits, but the microphone signal should be about 30 dB above that. If this value of signal is used, your contact is likely to be successful. This value can be found by on-the-air tests to determine how close the mouth should be to the microphone, and the point where the audio gain control should be set. Since most amateur radio station rooms are not soundproofed, if the mouth-to-mike distance is more than perhaps four or five inches, the mike gain may have to be raised to where room echoes begin to be picked up and transmitted. I have a wire guard on my microphone that extends out two inches. If the guard wire is held to the upper lip the modulation will be kept reasonably constant.

It would be nice to be able to set the mike on the desk, lean back two or three feet from it and talk (in soundproofed rooms at broadcast stations, this is possible and is what they often do).

If amateurs speak too far from the microphone, room noise and echoes will usually become annoying to listeners and can interfere with understanding. With too high a gain setting, if a telephone rings, or another receiver in the room sounds off, or people are talking nearby, or dogs are barking outside, all of these will create interfering output sounds from the transmitter. If the speaker is too close to a microphone, aspirant letters such as B, P, S, T and X may produce a puff of air or a hissing that hits the diaphragm and causes a distorted output signal. Rubber foam, cemented over the microphone front, may reduce this effect. If the operator speaks *across* the microphone from a distance of about an inch, rather than directly into it, the unwanted aspirant effect will be lessened. A person who speaks in a loud voice can be farther away from the microphone than someone who has a more subdued voice. All of these items must be considered when setting the microphone gain control. The best way to determine gain settings is to check with some other ham on the air.

Pronunciation, the proper sounding of letters and syllables in words, is important. Foreign amateurs, not skilled in speaking your language, are often unable to pronounce even some fairly common words. When speaking to these people, slow your speech materially, clearly enunciate all words and pronounce them carefully and properly. Think of yourself as helping to teach foreign hams the proper use of your language.

Enunciation is improved by using the lips, tongue and jaw to allow all of the syllables of all words to be produced properly. This is very important when speaking into a microphone. When you speak face to face with someone, their lip movements are seen as their voice is heard. When a microphone alone is being used, the assistance of reading the lips and facial expressions is gone. It is therefore more difficult to understand what is being said. Insufficient movements of the lips can result in mumbling, which interferes with comprehension. Keep those lips moving!

Calling and answering

When calling CQ on phone, listen first on what is apparently a clear frequency for a while. Make sure your transmitter is on the same frequency to which your receiver is tuned by turning off the RIT control on newer equipment. If the frequency appears not to be in use, and if tuning is necessary, tune up on the frequency as rapidly as possible and ask, "Is this frequency in use?" If there is no answer, after a few seconds, call "CQ" a couple of times, sign once a little slower than normal, using plain letters, then repeat the callsign phonetically, ending with, "Over," or perhaps, "Standing by." If no one answers it probably means no one happened to be tuned to and listening on that frequency. A single short "CQ" only produces results if someone happened to have his receiver tuned to that frequency. The chances are poor that someone will happen to tune across your frequency, let alone zero in on it precisely during the few seconds that a short CQ takes. Look at it as if you were fishing. You would not throw a line out and then in 10 seconds pull it back in again and quit fishing for the day. After about 15 seconds try another CQ to try to catch someone tuning around. This time call "CQ" four or five times and sign once. Repeat this two or three times so anyone tuning across your frequency will have time

to zero in on your frequency. After the last CQ, sign once using plain letters and then phonetically, followed by an "Over." It is not good to string a long, long series of CQs together that take up a minute or more. Use 20- to 30-second CQs. If no one answers, try again after 10 or 15 seconds. Unless you are after DX contacts, don't answer the CQ of a station you cannot hear well, particularly if you are using low power.

Remember, when using SSB there is essentially no carrier being transmitted that a receiving operator can hear. Many times a transmitting operator hesitates at the end of a sentence and the other operator starts talking, thinking it has been turned over. Unfortunately at the same instant the first operator may resume speaking. The resulting "doubling" results in neither operator's hearing the other. Always try to use an "Over," or the other operator's name with a rising inflection, or your callsign at the end of transmissions, to indicate you want the other operator to start talking. When listening, wait for some kind of indication that the other operator is expecting an answer.

To check into an SSB net, if transmitter carrier and antenna tuneup is necessary, either zero-beat the frequency of the station transmitting to do your tuning, or move to a clear frequency three or more kilohertz away. In the latter case, when tuned, shift to the net frequency and wait for the transmitting station to turn it over to the next station. If the net is operating properly, the next station should not start transmitting for a second or so, to give any station wanting to break in a chance to do so. A break-in station should say, "Break," or perhaps "Here is XXXXX" (your callsign). The net control station should step in, recognize the new station, and advise the proper action to be taken. Always allow the net-control station to handle break-in stations. If two or more stations try to handle a break-in station there will be confusion on the frequency.

Any time a transmitter emits a signal on the air the FCC requires it to be identified by callsign. At the end of a tuning session always transmit your callsign. Station identification is also required every 10 minutes during QSOs. It is not necessary to continually identify if making short back and forth transmissions which require only a few seconds to a minute or so. Keep track of ID times with all QSOs. A wind-up timer works nicely for this. Whenever you transmit your station callsign set the timer to 10 minutes. When it rings it is an indication that it is time to send your callsign again as soon as it is possible. It is wise to ID at the beginning of any transmission. If one of your transmissions lasts more than 10 minutes, at the bell, stop at the end of a sentence, sign your call and then continue with the transmission. Most phone QSO transmissions do not take 10 minutes, but each time you sign over to another station your callsign should be given and the timer set. Station ID is always required when a station makes a final sign-off. There

Continued on page 20

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Keys to Better Operating

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is apparently no requirement that the other station's callsign must be sent, but it seems only proper courtesy to send it at least when signing off.

CW operating

The term "CW" means "Continuous Wave," a different kind of a wave than the original spark-type emissions used in the early days of amateur radio code transmissions. Spark transmitters produced waves that varied up and down at some audio rate. It was the variations that the old receivers detected. When vacuum tubes were developed and were used in RF oscillators, they produced a constant-amplitude wave output, thus the term CW. When spark transmitters were outlawed on the ham bands in the late 1920s the term CW continued on as meaning Morse code radio transmissions.

Radio code operating has many well established and excellent communicating rules first developed by commercial railroad Morse operators and then seagoing and point-to-point radio operators. Such jobs depended on making perfect copy of all transmissions. Over the years they ironed out all of the undesirable methods of sending CW on the air. It is from their basic rules that our modern CW and even most of the phone transmission recommendations above were developed.

The basic calling procedure with CW is to call a station by sending its callsign, then "DE" (meaning "from"), and then sending the calling station's callsign. If conditions are good and the two stations know each other well, sending the calls only once may be adequate. In many cases in amateur radio, two stations will not know each other well. When answering a CQ, with modern equipment, probably one transmission of the calling station's callsign is sufficient but after the DE the answering station should always send the answering station's call at least twice. Even if the path is good, for a variety of reasons an answering station should repeat his/her callsign two or three times. It is not often that the called station's callsign must be repeated—that station can recognize its own callsign quite easily, even through QRM and QRN. An exception would be when the answering station is not on the frequency of the calling station. In this case it may be necessary to transmit the CQing station's call several times. When an answering station does not answer very close to the calling station's frequency, troubles may develop.

Obviously, if an operator sends too fast to another operator, time is being wasted. Only minimal information will be received. If an operator can only receive at 13 words per minute, it will be useless to send at 20 wpm. On the other hand, a 30-wpm operator can slow to 13 wpm with no trouble. If CW operators try to send faster than they can copy well, there is little chance that the higher-speed transmission will be too readable. (Of course, if a keyboard is used, sending speed will only depend on the *typing* ability of the person at the keyboard.) Try to determine the other operator's highest correct receiving speed as soon as possible. Whenever questions are asked but are not answered, the sending speed is probably too fast, assuming the sending is faultless. If break-in keying is being used and there are too many breaks being made, slow the sending. It may not be poor sending at the sending end, nor poor copying at the receiving end; it may be QRN crashes or QRM signals which may be unheard at the sending end that are interfering with the copy. Do not hesitate to use "QRS" (send slower) when conditions are poor. When QRN is bad, always reduce sending speed. The longer dots and dashes of slower sending extend the time of each letter, causing only part of a letter to be broken rather than possibly two or more letters by a static crash. One broken letter can usually be guessed, but two or more may cause confusion at the receiving end.

If sending CW with a keyboard, determine what speed a receiving operator who is not using a machine can copy adequately. Do not exceed that speed. If an operator is hand-sending at 20 wpm and it is being displayed on a monitor fairly well, send no faster than that when answering. If answered on a keyboard at 25 wpm, the sending operator will probably try to speed up, may make a mess of it, and the cardinal communications requirement is defeated.

When an operator is sending by hand to a computer keyboard monitoring station, the operator must send only up to the speed at which letters and spacing are error-free. Machines can only copy Morse code letters which are made within certain time limits. The dots must be close to one-third the length of the dashes, and the space times between dot and dashes must be equal to the length of a dot. Spaces between words must be more than those between letters. Letters must not be split. *Diditdahdit* is F, but *didit dahdit* is IN. It may sound almost the same to the ear, but the machine is not fooled! When there is QRN at one or both ends, slow down, even when using a machine.

Splitting letters or running two letters or words together when sending Morse code is easy to do, but can be very confusing to the receiving operator. If GT, MA, TK, or Q is sent, but the word MET is what was supposed to have been sent, the receiving operator can get confused. When an L is supposed to be transmitted but it comes out "*didahdit dit*," that is RE, which results in a misspelled word and possible confusion. Make sure there is spacing in between *all* letters, but *no* added spacing in between the dots and dashes of letters. Furthermore, there should be more space between two sentences than between two words. If "deter mine" is sent, does it mean that, or was it supposed to mean "determine?"

While it is quite proper to use keyboard-type punctuation marks on the air, such as a period at the end of sentences and commas, amateur operations have come down through the decades with the general character "BT" used to mean the end of a sentence, or end of a paragraph, or just a means of stalling while thinking about what is going to be transmitted next. It is not required to send a "KA" at the

start of operations, nor is anything other than a K needed to turn over to another station in most cases. In DX operations the use of KN is OK as it indicates "I am not finished talking to this station; please do not break in." Never use KN after a CQ!

A hard and fast CW sending rule is: "If an error is made while sending a word, stop, send an error sign, go back to the *beginning of the word,* then resend the *whole* word." Never stop and send only the mis-sent letter correctly. Worse yet, do not add a missing dot which was supposed to have been the last part of the previous letter! Send only whole letters, never broken letters. Send only whole words, never broken words. The correcting rule can be expanded to:

•When an error is made in sending the *first letter* of a word, stop, send an error sign, go back and resend the whole word *before* the improperly sent letter and continue on.

This is absolutely necessary when handling traffic messages.

How is an error sign made? Internationally it is eight dots, although "?" or "??" may be used, and sometimes "SN" is used. Whatever error sign is used, it really only has to be something that cannot be copied as a letter, number, or a misplaced punctuation mark. It has to be something that stops the receiving operator's copying.

As with phone communications, after 10 minutes of operating, a station is required to send its callsign. End all five- to 10-minute transmissions with your callsign and a K. If a short answer is required, after sending the question, end with the question mark and a K. With such short transmissions do not bother with callsigns. Wait for the 10-minute period to come up. Operators often use "BK," apparently meaning, "Back to you." The letters "BTU" mean the same thing.

It is standard procedure in DX pileups to call the DX station with just the callsign of the calling station once or twice, close to the DX station's frequency, or on any frequency to which it indicates it is listening. The loudest station being heard by the DX station will be the first worked, of course. But keep trying every time the station signs clear. However, do not use this procedure when answering non-DX CQs—it may sound to the CQing station like some station is ending a test, or some station is being improperly called. A CQing station wants to know that whoever is answering is actually calling the CQing station. In many cases the CQing station may not be tuned to the answering station's frequency for some reason and may not hear the first part of the answering call.

The Q signals

When calling CQ on CW the procedure is very similar to that discussed for phone. With CW you should normally send at the speed at which you want the answering station to use. Don't be afraid to answer a 30-wpm CQ call at 20 wpm. Most of the better operators are quite willing to work at *somewhat* slower speeds, but it is generally not a good idea to answer a 30-wpm CQ with a 5- or 10-wpm reply. If band conditions are bad, due to QSB or QRN, always call and operate at slower than normal speeds.

Using CW, before calling "CQ" on a frequency, use the Q-signal, QRL?, which means, "is this frequency in use?" Do *not* send "QRL" before a CQ because it means, "This frequency is in use, please do not use it." QRL alone indicates someone is replying to a "QRL?" call of a station which the listening station may not be able to hear. If someone sends QRL? on a frequency you and another station are using, answer this question with the statement, "QRL," or possibly, "Yes." Always remember, the station you are copying may be in the skip zone of the station sending the QRL?.

There are over 50 internationally used CW Q-signals. Those that amateurs are most likely to use are shown here in table form.

Continued on page 22

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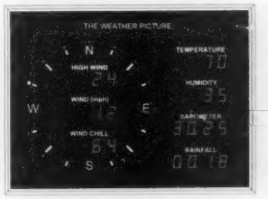

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QRG	The frequency is ...
QRK	Your readability is ... (1 – 5) (See QSA also)
QRL	This frequency is in use; please do not interfere
QRM	Interfering stations
QRN	Interference due to static or other noises
QRO	Increasing to ...; or using higher power
QRP	Decreasing to ...; or using low power
QRQ	Send faster
QRS	Send slower
QRT	Stop sending
QRU	I have nothing for you
QRV	I am ready; start sending
QRX	Wait; I will call you shortly
QRZ	You are being called by ...
QSA	Your signal strength is ... (1 – 5)
QSB	Your signals are fading
QSD	Your keying is defective
QSK	I can hear you between my signals (I am using break-in)
QSL	I acknowledge or confirm receiving ...
QSO	I can communicate with you ...
QSP	Relay a message to ...

Table 3. *Handy reference to the most commonly used "Q" codes.*

Keys to Better Operating

continued from page 21

When followed by a question mark, any Q-signal asks a question. For example, QRG? means, "What is my (or your) frequency?" QRZ? means, "By whom am I being called?" While there may be amateurs who discourage the use of Q-signals with radiotelephone communications, some Q-signals fit in very nicely with such operating. As examples, QRM, QRN, QRP, QRX, QSB, QSO, QSL (also a confirmation card for amateurs) and QSO are often heard. On phone, "Use VOX" (Voice Operated Xmissions) means the same as "QSK" does with CW. The use of QSK and VOX helps greatly in QSOs and nets on the amateur bands and should always be used if possible.

Tuning

Tuning a transceiver exactly to another station's frequency with CW is more difficult to do than with SSB. With SSB, if the receiving operator's RIT control is off, when a station is tuned in so the voice sounds most natural, the listener's transmitter should be exactly on the other station's frequency. This is known as "zero-beating" the two transmitter frequencies.

When tuning in a CW station using a transceiver, and again, providing the RIT control is off, the receiving operator's transmitter will be set to something between perhaps 300 and 1000 Hz from the transmitting station's frequency when it is tuned in. With most transceivers, whatever beat-tone frequency is produced by a received signal, if the tone heard when the key is pressed is the same, the transmitter signal will be very close to zero-beat with the received signal. If the key-down and the beat-tone frequencies are different by 500 Hz, then the receiving operator's transmitter will be 500 Hz away from the other station's carrier frequency. If a receiver uses a 250-Hz wide CW IF filter, signals 500 Hz or more away may never be heard. It is very important when answering a general type of CQ to answer as close to the calling station's frequency as possible. In DX pileups if there are many signals on the DX station's frequency, it may pay to detune a few hundred hertz to answer the DX station.

In older-type equipment, where the transmitter and the receiver are separate units, if you want to call "CQ" it is necessary to learn how to tune the transmitter to a desired clear spot in the band. Either turn off the final amplifier stage, or use a dummy load on the transmitter, or turn the transmitter's output power down to minimum before tuning it across the band until the transmitter's signal is heard in the receiver as a tone of about 700 Hz. A CQ can now be called on this frequency after an unanswered QRL? is transmitted. Unless you are after DX contacts, do not answer the CQ of a station whose signals are poor due to band conditions.

Zero-beating

To zero-beat a received signal, such as a CQing station, with a separate transmitter and receiver, tune the

transmitter's oscillator until its tone in the receiver exactly matches that of the tone of the CQing station. Many transmitters have a "Calibrate" or "Test" switch or button which only activates the transmitter's oscillator to allow zero-beating the local transmitter to a received frequency. It provides a weak transmitter oscillator signal for the receiver but produces no radiated signal during the zero-beating process. When using more advanced transceivers, with their RIT control off, when the frequency check switch is on, the tone heard must match that of the beat-signal tone of the received transmitter signal to ensure zero-beat operation.

How close to zero-beat should stations be? If they are on exactly the same frequency that is as good as it can get. In the case of CW stations, they probably should be within 100 Hz of each other or they may be taking up too much of the band. Vacuum-tube transmitters with VFOs almost always drift. They may have to be checked for zero-beat operation every few minutes while the other station is transmitting, particularly if they have not been warmed up for 30 to 60 minutes.

Stations operating several hundred hertz apart are just asking for interference troubles. While one of the stations is transmitting the other station's frequency is not being used. It may be selected as a good spot for a QSO by two other stations, or a good spot for a CQ. If a QRL? on that frequency gets no answer from the transmitting operator, there is no reason why that frequency should not be used for a CQ or QSO. It will then be up to the transmitting operator to advise the other operator with whom he is in QSO to zero-beat with his/her frequency. If the transmitting station was using QSK, the QRL? call would probably have been heard and an answering QRL could have been sent to stop the CW or QSO on that frequency.

It should be mentioned that there are procedures used by the various armed services which may vary from international operating procedures. Those procedures were developed to fit the needs of their particular services. Radio amateurs have always used the procedures which are in general use all over the world, those which have been explained here. Communications will be much more pleasurable if all amateurs use the same basic time-tested procedures.

It is unfortunate that thousands of well-meaning amateur radio Elmers are either ex-military people or are mostly phone operators and do not know the proper international procedures for amateur CW operating. The result is many poorly trained new amateur radio operators on our bands today. Poor operating takes much of the fun out of both phone and CW operating. Hopefully this information will get to some of those Elmers and to those they are helping so much. 73

Probing Auto Electronics

continued from page 13

leakage path should exhibit a current value similar to the value determined as a reference at the battery terminal.

F. Taking note of the circuit and the current measured at each fuse position (circuit branch) will provide a clue as to which circuit contains the excessive leakage path.

There is an alternate test method that may be used when two people are available, one to perform the test and the other to watch the light bulb. If the light bulb filament glows when connected between the battery terminal and cable, then leave the bulb connected and open each fuse circuit and potential circuit path. The light bulb will cease to glow when the leakage path has been opened.

Following the logic of an Ohm's law problem analysis will provide the clues necessary to diagnose automotive electrical systems. Help your neighbor identify his automobile's electrical problem and be a hero! 73

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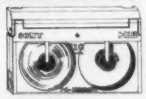

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A Real Handful

Inside Alinco's DJ-C5 dual-band transceiver.

Terry Bennett VE3EGA
PO Box 293
Markham ON L3P 3J7
Canada
[tebenne@ibm.net]

A credit card-sized two-meter + 70 cm transceiver small enough to *really* go in your shirt pocket was too much for this miniature-radio lover to resist—I had to get me one of those babies! As an Alinco DJ1-FT owner, I was familiar with the company's attention to detail and the general reliability of their products. A quick look at the C5's specifications convinced me that the DJ-C5 had a lot going for it.

I had heard that the new Alinco DJ-C5 radio was going to be available at Dayton, so as soon as the main arena opened I was checking out prices (the Dayton price was just under $200). I had previously checked the DJ-C5 specifications, so my justification was simply this—I needed a radio that was versatile, easy to use straight from the box, and small enough to carry just about everywhere (WHD = 56 mm x 94 mm x 10.6 mm, 2.2 inches x 3.7 inches x 0.417 inch). What's more, the DJ-C5 weighs in at a mere 80 grams (2.82 oz.) and operates off a 3.8 VDC lithium-ion battery.

Out of the box and on the air!

On unpacking the radio (at the Hamvention®) I was delighted to find that it actually did work straight from the box—no battery charging—as the internal lithium-ion battery was alive and well! I quickly set up a simplex frequency in VFO mode and was in QSO within 10 minutes of purchasing the radio—not many handheld manufacturers can guarantee this kind of quick setup! The radio is housed in an aluminum case and all functions are keypad-controlled except for the on/off switch and PTT. The radio comes complete with a charger and clear plastic (I didn't like this!) carrying case. The C5's transmitter is 300 mW—enough for line of sight working, but within buildings (Hara Arena) sometimes hit-and-miss. On nonrepeater channels, QRP usually needs unobstructed RF takeoff! Higher-powered radios also had their share of problems (due to high RF noise and obstructions), so I was not unduly concerned.

The radio's audio output level (60 mW) was, unfortunately, not high enough to overcome the extremely high ambient noise level at Dayton, and even an *additional* purchase of the tiny EME-49 speaker/mike did little to improve matters. I initially solved the problem by initiating the Bell feature on the radio, which gave me a pleasant alert tone when someone called on the frequency! However, I did make a mental note of a neat solution for future flea markets, so watch out for a future article!

First repeater contact

Later that day and back at my hotel, I was able to find the local (Piqua) repeater and exchanged reports with a couple of hams who gave the radio an excellent audio report. My Dayton friends challenged my wisdom in purchasing a 300 mW radio instead of a typical higher powered unit. (I was ready for this one!) I explained that with two meters and 70 cm on board, I will always be in range of at least one repeater practically everywhere I might visit in the USA or Canada. With 50 memories to play with, life will never be dull!

The skeptics were still unconvinced, hugging their brick-sized radios, their speaker-microphones hanging from their collars like sleeping bats, as they mumbled things about needing lots of power. In the meantime, I simply popped the C5 in my shirt pocket and off I went to load more repeaters into the radio's memory. Right now (days after Dayton), I am at the office, C5 in my shirt pocket and ready for more lunchtime QSOs—I'll take a bet that

their radios sit at home in their shacks until the next hamfest.

Planning

A word of caution! Loading 50 memories needs some careful planning—I suggest thinking carefully about future trips and your general ham radio activities. Enter frequencies according to your own personal requirements! Adding and deleting frequencies is, however, very simple with the C5, and a few minutes with the manual will get you started.

I set up my C5 so that the first 10 memories would be two-meter local repeaters, the next 10 would be the major two-meter metropolitan area (in my case, Toronto) repeaters, and the next 10 would be out-of-town ones. UHF repeaters were programmed from #30–45, leaving room for five simplex or "scratchpad" channels as required! The two-meter calling channel of 146.520 MHz was programmed into the VHF call memory. I didn't bother programming a UHF call frequency due to low activity on UHF simplex in my area.

Operating and programming the C5

I have noticed that most small radios have comprehensive manuals that require you to sit quietly for an hour or two in deep concentration studying the intricacies of the radio. Not the case with the C5. The folks at Alinco managed to condense theirs into an easy-to-understand *(and remember!)* 20 pages—which can *also* fit in a shirt pocket if necessary!

Programming the radio was a piece of cake. Simply select the desired memory channel number (using up/down buttons); return to VFO mode (VM/MW button); use the up/down buttons to select the desired frequency; press function (F); and hit the VM/MW button to store! This procedure is all that is required to change a stored frequency. The range of repeater offsets can be set between zero and 99.995 MHz. Once the offset is programmed, pressing Monitor allows you to monitor the repeater-input frequency. Pressing Monitor again returns the radio to normal operation.

A neat feature of the C5 is the inclusion of the aircraft band and of Automatic AM Receive—great for checking out the action at local air shows!

The DJ-C5 has CTCSS built in for both TX and RX (as required); selecting from 26 standard tones will give you all the regular tones in use. The C5 will automatically activate the encoder with the same decode tone when set!

The C5 features Automatic Power Off, Key Lock, Adjustable Frequency Step, Channel Scan, Battery Saver, Bell and (for those of you who are overseas travelers) European Tone Burst. As a general rule of thumb, I find that the C5 will access local VHF/UHF repeaters that are within an eight- to 10-mile radius of my QTH and that the communications capability is somewhat more efficient at UHF as the antenna is much closer to one-quarter-wavelength long. Walking around my town, I found that the audio level (range is 1–8) was most comfortable at level 7, even with vehicular QRN. I find that I am now taking a radio to places where I would previously wouldn't have. If you are part of an ARES group or local Emergency Service, this flexibility may help you to avoid missing a callout message. I am even considering putting a DJ-C5 on my Yorkshire

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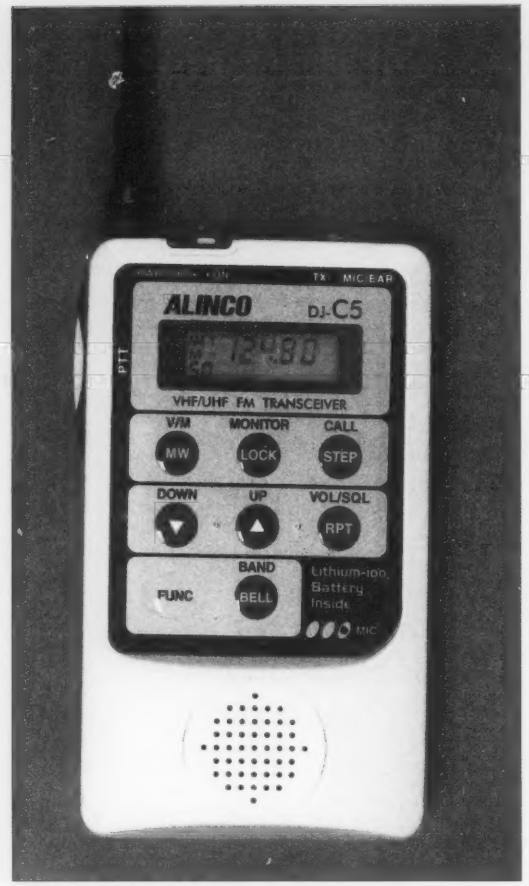

Photo A. *Alinco's DJ-C5, actual size.*

terrier to avoid shouting! The possibilities are endless with such a tiny, lightweight radio.

Battery charging

The DJ-C5 charger operates by dropping the radio on its back into the charger (a really neat unit that holds the radio in place). A green LED indicates charging and extinguishes after charging is complete. Maximum charge time is two hours. A great thing about lithium-ion batteries is they do not develop a memory (unlike nickel-cadmium) and therefore will offer much longer periods of operation per charge! The manual suggests that they are good for 500 charges, so I strongly recommend charging habits different from those used for nickel-cadmium batteries. For example, *If the radio works, the battery don't need charging!* The reason? It has a straight-curve discharge (think of your car's gas tank!). Using this thinking, you will be sure to get the maximum benefit from your lithium-ion battery technology!

Removing the screws on the rear of the radio accesses the C5's battery (if this is ever required!). Gently lift off the back cover and set it aside. I recommend purchasing a new set of tiny Phillips screwdrivers (Radio Shack®) prior to attempting this, as the screws are tightly fitted and there is always the danger of damage to the screw head! The battery takes up about one third of the total size of the radio. To remove the battery, simply ease it out and unplug its connector. Replacement batteries are available (at this time) from Alinco, priced at approximately $35.

Specifications

The DJ-C5 (out of the box) covers 118–173.995 MHz Rx (118–135.995 AM Rx) and 420–449.995 MHz. Tx coverage is 144–147.995 and 420–449.995 in two bands.

A MARS/CAP modification is available (simple) that will extend the Tx from 136–173.995 MHz and 380–472.995 MHz (aircraft band is unaffected).

The radio's sensitivity is excellent, even with the supplied 4.5-inch flexible antenna. I receive the weather radio stations quite well (good sensitivity test for Rx and antennas!).

I have not tried an alternative antenna on the radio, as I felt this would compromise the threaded connector, but the radio may accept a modified antenna for balloonist or similar operation.

As I previously mentioned, the Rx audio (60 mW) is not as high as with "brick" HTs, but it is more than sufficient for normal personal outdoor use in parks or streets. An audio accessory is recommended for flea markets or areas where the ambient noise is likely to be high. This is a miniature (2.5 mm) stereo-type jack socket on the top of the radio that accepts remote mike/audio accessories.

To date there is a good range of Alinco accessories that can be used with the DJ-C5. I purchased the miniature speaker/mike (model EMS 49) and I will ultimately add an ear mike (and dark glasses!).

A word of advice: Subminiature stereo jacks are hard to find. Those of you who want to add your own mike/audio I/O (e.g., packet) won't find them at Radio Shack—you'll need to check out Mouser or a similar supplier.

Conclusion

I love radios that are easy to understand, program, and operate. And I hate hunting for the manual and relevant sections every time I want to change something. For these reasons alone, the C5 is the perfect partner for the user who wants a less complicated radio, yet still needs to retain commonly-used features such as input-frequency monitoring, channel scan, and quick frequency entry. Plus, the DJ-C5 has dual-band versatility, too!

Will I sell mine at the next flea market and get something with more power? No and no. I'll keep this rig, thank you—well done, Alinco!

Sources

The Alinco DJ-C5 dual-band transceiver is available from:

Alinco USA
438 Amapola Ave. Suite 130
Torrance CA 90501
Tel: (310) 618-8616

Further information is also available from Alinco at [www.alinco.com]. And you might be interested in my own Web page [www.angelfire.com/biz/cqradio], where there is also an Alinco link (a linko?). Have fun! 73

Electronic Bug Emulator

Put some personality back into your CW.

J. Frank Brumbaugh W4LJD
P.O. Box 30—c/o Defendini
Salinas PR 00751-0030

How many of us initially succumbed to the lure of an electronic keyer and sold our bugs, only to become dissatisfied at the lack of personality in our CW? Or made keying errors with the new gadgets and wished we had our old bugs back? Yes, you and me and lots of others. With this article, I hope to take many of us forward to the past.

New standard Vibroplex® bugs cost $160, and the price rises rapidly for the fancier models. This is a cost most of us cannot afford to pay. But all is not lost. Described here is a very simple, cheap, and easy way to put the feel of a bug back into our operating, and it can be done for less than five dollars!

However, before we spend that five dollars there is a minor problem to solve. Some of us already have single-lever paddles, which is what is needed to complete the electronic bug. As far as I know, all such paddles have grounded wipers. This circuit requires that the paddle have all three contacts floating—dot, dash, and wiper. Unless an existing paddle can be modified, it may be necessary to home-brew a single-lever paddle in order to take advantage of this project.

Fig. 1 illustrates the simple electronic portion of the single paddle bug. The circuit is not original with me. I started with a portion of a 25-year-old design by W7ZOI and made some modifications to get the results I

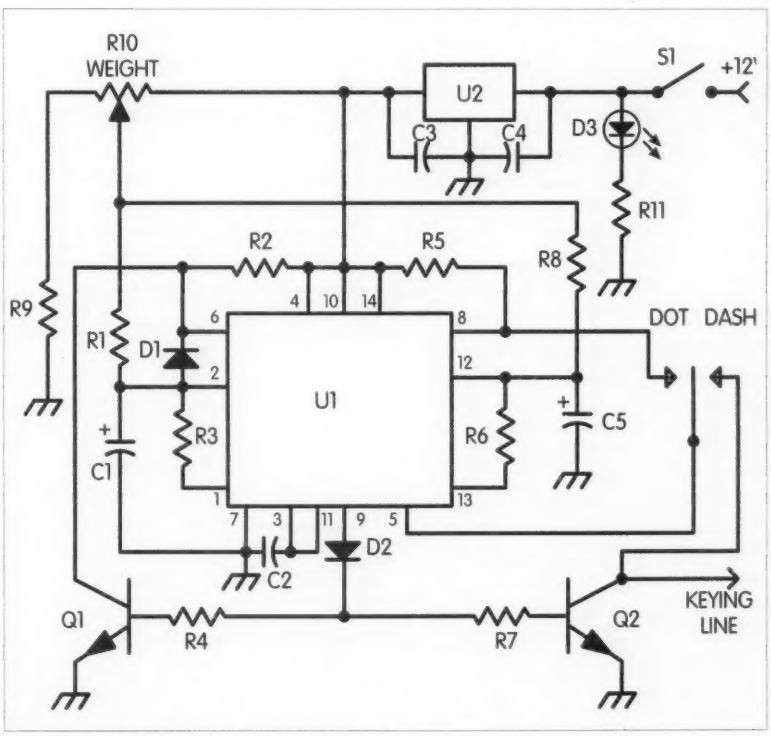

Fig. 1. *Schematic of spaced dots generator.*

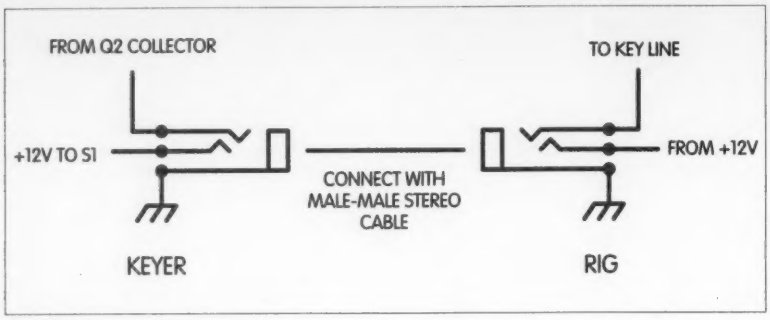

Fig. 2. Power and keying wiring.

needed. The original circuit was more complex and did things not needed in this final design.

Both timers in U1 together produce perfect dots and spaces, the speed of which is controlled by the weight potentiometer, R10, which serves the same purpose as moving the weight on a bug. When the paddle is pressed for dots, a stream of perfectly spaced dots is generated and keys the rig through Q2, the keying transistor. Dot speed is adjustable, as on a Vibroplex, from approximately three to 25 dots per second—equivalent to a keying speed range of seven to 60 wpm.

When the paddle is pressed for dashes, this is a "key down" condition exactly as in a bug, allowing the operator to make his own dashes and bringing back the familiar bug "feel." In addition, the dash side of the paddle can be tapped just as if it were a hand key for those times when it is necessary to key very slowly. Also, this function is retained even if the circuit is not powered.

Construction

The spaced dot generator can be constructed on a small piece of perfboard or a general-purpose printed circuit board, or you can use the "dead bug" style of ugly construction on a small piece of unetched printed circuit board. Parts placement and lead lengths are not critical. It can be mounted in a small enclosure, or possibly right on or inside the base of the paddle.

To reduce clutter, it will be preferable to solder three jumpers on the bottom of U1 before mounting it, whether a socket is used or not. Strip the insulation from a short length of stranded wire and separate the strands. Solder one strand between pins 4 and 10 on the bottom of the chip, making the soldered connections high on the pins of the chip, and clip off any extra lead lengths. Solder another jumper between pin 3 and pin 11. Place a small piece of cellophane tape on the bottom of the chip covering these two jumpers as insulation. Now solder a final jumper between pin 10 and pin 14 as before.

Power can be supplied by an internal battery or by taking operating voltage from the rig it will be used with. **Fig. 1** includes an optional On/Off switch and LED if an internal battery is used. In this case, you may or may not want to include the voltage regulator U2.

If taking power from the rig for operating this unit, a stereo jack must be added to the rig. It will carry +12 V, ground, and the keying line through a connecting cable. The ring carries the keying line, the tip carries +12 V, and the sleeve is common ground. **Fig. 2** illustrates using a stereo jack on both the dot maker and the rig, and connecting the two through a three-wire cable with stereo plugs on each end. However, the cable can be hard-wired into the electronic circuit and the stereo plug on the other end plugged into the new jack on the rig.

This circuit draws only about 10 mA with U2 installed. If you wish to have audio monitoring of your keying, perhaps for practice sessions, a small piezoelectric alarm can be connected directly between the +5 volt bus and the collector of Q2. This will add about 10 more milliamps to the total drain with key down.

Forward to the past

Now that you have your new electronic bug emulator, no one you QSO with will have any idea you aren't using a Vibroplex! 73

Parts List

C1, C5	1 µF 10 V
C2, C3, C4	0.1 µF disc or monolithic
D1, D2	1N4148, 1N914, or equivalent
D3	LED
Q1, Q2	NPN bipolar transistor (2N3904, 2N4400, 2N2222, etc.)
R1, R8	33 k 5% 1/4 W
R2, R5, R9	47 k 5% 1/4 W
R3, R6	100 5% 1/4 W
R4	10 k 5% 1/4 W
R7	2.2 k 5% 1/4 W
R10	10 k linear potentiometer
R11	2.4 k 5% 1/4 W
S1	SPST toggle or slide switch
U1	556 dual timer IC
U2	78L05 regulator

Table 1. Parts list.

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Voice/FAX (765) 962-3509 thomil@infocom.com

Seeing Dits and Dahs

The K2659 Morse Decoder Kit from Velleman Electronics

Marshall G. Emm N1FN
2460 S. Moline Way
Aurora CO 80014
[n1fn@MorseX.com]

As one whose ham activities are 95% HF CW, I have long held the view that when it comes to copying code, the human ear will beat a computer every time. An experienced CW operator can copy code that is barely audible, signals plagued with QRM, QRN, and QSB.

Computers need a good solid signal with a high signal-to-noise ratio. And when conditions *are* good enough for computers to copy Morse, there are far more efficient modes available to them. The Velleman Morse Decoder has done nothing to change my opinion, but it was fun to build and does indeed have some practical applications.

I saw the decoder kit at TechAmerica® where some 30 different Velleman kits are available (Velleman makes about 150 different kits), along with kits from several other suppliers. The Velleman kits are made in Belgium, and reflect an unusually high standard of packaging—the kits are in plastic boxes, which are useful for sorting parts during inventory and construction.

In many cases the box can be used as a permanent enclosure for the completed project.

How it works

The Morse Decoder kit includes a small microphone, which is placed near the speaker of a radio receiving a Morse code signal. The audio from the microphone goes through an A/D converter, which passes a digital signal to a microprocessor.

When the unit is correctly tuned, the digital signal is either on or off depending on whether a tone is being sent. Three pots are used to process the audio signal before conversion. They control the audio bandwidth, the center frequency of the audio bandwidth, and the sensitivity of the microphone. An LED is used in tuning, and blinks in time with the Morse signal when the unit is properly adjusted.

The processor analyzes the pattern of dots and dashes and interprets them as characters which are scrolled along a 16-character LCD display. The decoder recognizes the alphabetical characters, numbers 0–9, and most of the prosigns ordinarily used in CW traffic. The manual says the unit will read code at "almost any speed," and that's pretty much true.

How well it does all this is a matter of judgment, but I'll save my comments on performance for later.

Construction

The decoder kit was relatively easy to build, with step-by-step instructions in the manual. It took me about an hour to put the kit together. As is my usual practice, I installed the IC sockets first, even though the instructions don't have you do them until after the resistors and diodes. With nothing else on the board, so it will lie flat on the table, the sockets are a lot easier to manage.

The PC board was of very high quality, silk-screened with component layout on one side and solder-masked on the other. Generally I found the components to be of high quality and easy to identify, with the exception that some of the terms used for component types were not what I am used to in kits from US manufacturers. For example, there was one capacitor described as "100 nF MKM" and three described as "sibattit." Fortunately, the parts count was low enough that these were quickly identified, even though the MKM proved to require the tail end of the process of elimination. Last one left? Fits the spot? Must be it!

All of the axial-lead components ("flat" resistors, diodes, etc.) were supplied mounted on a single "ammo strip," and—get this—they were on

Photo A. *Test-driving the "send" setup.*

the strip in the order in which they were called for in construction. That sure made it a lot easier to find the components when they were needed!

The installation of the LCD display was a bit tricky, as was the LED. The display is mounted above the main board on metal stand-offs, and is connected by 14 plain wires (supplied on the ammo strip!) which go through a hole in the display and then through a hole in the circuit board, and are soldered in both places. I discovered that the spacing of the wires on the ammo strip was such that every other wire matched a pair of holes, so I cut them apart, leaving seven wires still attached by one side of the ammo strip. I fed them through the odd holes in the display and down through the circuit board, and the remaining piece of ammo strip tape held them in place while I soldered them on the circuit board. Then it was a simple process of trimming the leads above the LCD display and soldering that end, and finally repeating the process for the remaining seven wires in the even holes.

The instructions for the LED read, "The upper side of the LED should slightly overlap the display." That took me a minute or two to figure out, but what it means is that the LEDs are inserted only a little way into the holes so that the top of the LED is flush with or a little higher than the top surface of the display. Now that I think about it, I'm not sure how I would have described it myself!

The instructions tell you to connect the microphone using a "screened cable," but the manual's illustration shows the microphone soldered direct to its connecting pins on the front side of the circuit board. It seemed reasonable to me that you would want to put the display between yourself and the audio source, so a microphone on the back of the unit would make more sense than on the front. I used shielded audio cable long enough to locate the microphone at the back of the reader.

No real problems were encountered in construction, but I mention the component ID and documentation situations because I can imagine that these could be serious problems in a more complex kit.

The smoke test

The power supply for the decoder kit can be either a small transformer providing 7–8 VAC at 250 mA (there is a rectifier circuit on board) or DC at 9–12 V. The circuit includes a voltage regulator, so I connected my 13.8 VDC shack supply without further consideration. Actually, there was a little consideration necessary because they tell you to connect power, but not exactly where. There are three pins, marked VA, VB, and a symbol. A quick look at the board and the schematic should tell you that the symbol indicates the common or ground terminal, the VA and VB pins are both used if you are connecting an AC supply, and +DC can be connected to either VA or VB. There is no on/off switch. As soon as power is connected, the display reads "VELLEMAN KIT," and you can use a small trimpot to adjust the contrast. At that point you are ready to place the microphone near your radio and start to copy code.

The Morse Decoder in operation

Again, the documentation is rudimentary at best. Which is unfortunate, because the decoder is not particularly easy to use. They give you starting settings for the three controls, and then have you adjust them until the LED flashes and the decoded text is displayed. The adjustment can take a few attempts but you get used to doing it with a little practice.

There are some things they could tell you that would make life a lot easier. For example:

•A character is not displayed until the following character has been sent, or after about three seconds of silence.

•The unit takes a considerable amount of time to synchronize to the speed of the received code. When the speed changes, meaningless characters will be displayed for several seconds until the decoder can re-synch. This seems to be less of a problem when speed is increased. When the speed is decreased, you will often see the individual elements of characters sent as an endless stream of Es and Ts. Sometimes, in fact, it seems the unit will never re-synch unless you disconnect the power and let the processor start over.

There is nothing in the documentation to indicate how non-alphanumeric characters and punctuation (periods, commas, and question marks) will be displayed. An unrecognized character will be displayed as an asterisk. For the record, here's the list, as far as I was able to determine from trial and error:

Sign	Displayed As
BT	=
HH	% (error sign)
CT	[
AR	e
AS	w
KN	*
SOS	*

Table 1. *Key to the signs that appear in the display.*

•I was able to verify correct code reading at speeds from 7 wpm to around 50 wpm, using the sidetone on my electronic keyer and a test message sent repetitively from the keyer's memory. At the upper end of that range, an increase in sending speed required two or three repetitions of the message before the decoder would synchronize. A reduction in speed

Continued on page 56

Low-Voltage Detector

...for a number of uses.

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266-4025

Recently, a friend asked me to assist him in developing a circuit that he could use on a car battery-powered system that he has installed in his ham shack. The battery operation, in his specific application, provides power to his electric door locks, alarm system, enunciator, ham gear and other items. The 12 volts from the car battery is bused throughout his house and shop. Because the battery is the central power source for a multitude of critical systems, the health of the battery is extremely important. Under most circumstances car batteries and chargers are quite reliable, but there are occasions when a power failure may occur. Dislodging the charger's power cord or having a commercial power loss happens more often than we'd like to admit. Also, car batteries fail upon occasion—and seldom give any warning.

My friend asked if a project could be developed to provide a warning because his system did fail, when the charger became unplugged. The problem went undetected until *everything* failed, including his door lock control. After studying the variables involved in a battery-operated system, we determined that the most predominant failure mode is a loss of terminal voltage, which is easily detected. Because my friend's 12-volt system is bused everywhere, warning detectors could be placed in strategic locations where at least one would be observed, should a failure occur.

The devised circuit is simply a voltage comparator driving an LED. What could be simpler? During the development of the circuit, many threshold detector designs were considered and all would have worked well. The design selected for my friend's application is shown in **Fig. 1**. The criteria used for selecting the circuit required a variable threshold adjustment and a circuit that would drive an LED. The use of an audible alarm

Continued on page 38

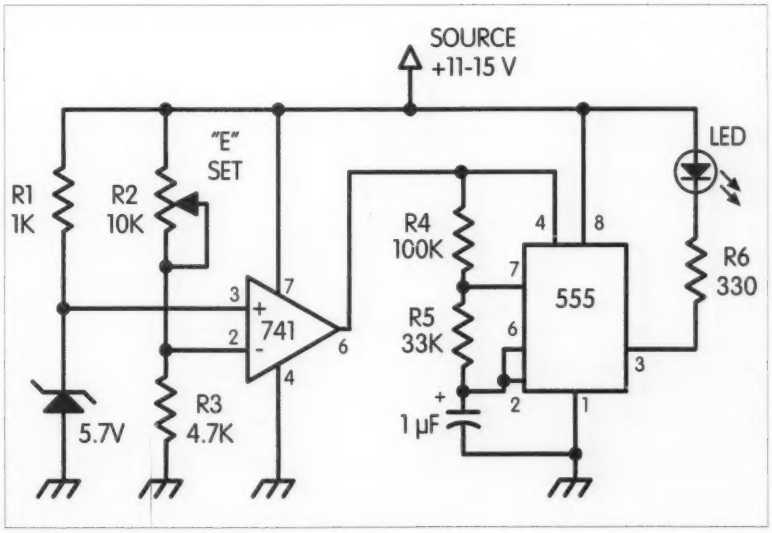

Fig. 1. *Low battery voltage detector.*

George's XE-lent Adventure

Part 2: Days 10–18.

George Pataki WB2AQC
84-47 Kendrick Place
Jamaica NY 11432

Tuesday. The *Radio Club Azteca* doesn't have its own place, so it holds its meetings twice a month at the Federation. Not having its own place, it doesn't have a station, but it does have a beautiful QSL card: XE1RCA. However, this does not compensate for those XEs who have stations, do operate, and promise QSL cards—when they don't even have one.

Founded in 1932, *Azteca* is the oldest amateur radio club in Mexico City, presently having about 30 members. Once a year, the club organizes a national contest. Theodoro XE1YQQ and Rosa XE1YQR drove me to the Federation in the evening. There I met Memo XE1NJ, the director of IARU region 2, area C, and the executive secretary of the Federation. Memo, a building administrator, was licensed in 1978; he is a DXer with 317 countries confirmed, and works only SSB on 10-15-20 meters. His wife Rebeca is XE1RUN and she is active. His son Memo Jr. is XE1OJ, and his daughter Ady is XE1NG—both are inactive.

In 1985, Memo participated in the DXpedition to Revillagigedo when the XF4MDX call was used.

We met some of the members of the *Azteca* radio club (**Photo A**). First to arrive was Arturo XE1NAD, the club's president (**Photo B**). Every year they have an election for president and you can be re-elected just once. I visited his station the next day.

I also met Felipe XE1MHF. He works in the printing industry, was licensed in 1990, and operates only on SSB, mostly on two meters. His wife Olga XE1XZT was licensed in 1996.

Jean-Pierre XE1YVE is a French-born electronics engineer, licensed in 1988; Emir XE1PAR is a retired doctor who—despite his name—does not have a harem. I visited Emir three days later.

Manuel XE1JRI sells and installs computers, and trains the users. I saw him and his family of amateurs the following Saturday.

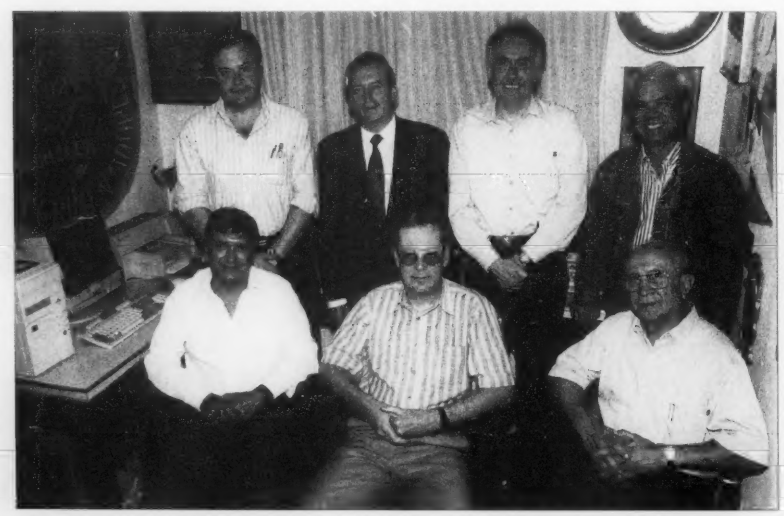

***Photo A.** At the XE1LM club station, standing, left to right: Efraim XE1JGM, Manuel XE1JRI, Arturo XE1NAD, Carlos XE1FOX. Sitting, left to right: Felipe XE1MHF, Jean-Pierre XE1YVE, Emir XE1PAR.*

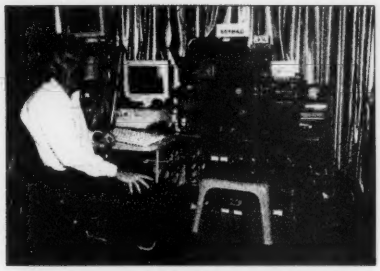

***Photo B.** Arturo XE1NAD, president of the Radio Club Azteca, is active on satellites on 144/432 MHz and on 6 m with a rotatable dipole.*

Carlos XE1FOX is assistant director of IARU, region 2, area C, and also director of the Federation. Carlos works in advertising. He is a DXer, works only SSB, and has over 200 countries confirmed.

Efraim XE1JGM, is a past president of the club; I had visited him three days earlier.

I took some group photos at the XE1LM club station (the one that seems not to have QSL cards), said *"Hasta la vista,"* and returned to my hotel.

Wednesday

In the morning, Arturo XE1NAD, the president of the *Radio Club Azteca*, picked me up from the hotel and took me to see his station. Arturo, a physicist, is the system manager for Penoles, the world's largest silver-mining company. Arturo is very enthusiastic about amateur radio and has plenty of excellent equipment. He was licensed in 1994; operates SSB, RTTY and satellites; and has a nice QSL card. He has a 40-foot tower on the roof, 120 feet from the ground. On that tower, Arturo has a three-element monobander for 10 meters; a three-element TH3-Jr that is a three-element yagi for 10-15-20 meters; and a two-element yagi for 40 meters. He also has a rotatable dipole for 17 meters and a rotatable dipole for six meters. Furthermore, a G5RV is used for 10 to 80 meters and, with a tuner, for 160 meters.

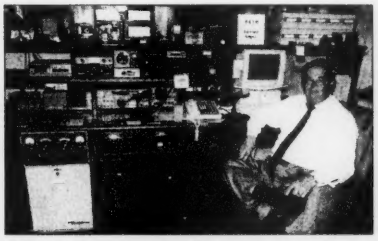

***Photo C.** Lorenzo XE1U has two great stations: one in Mexico City, the other in Tepotzotlan.*

Arturo is working satellites on two meters and 70 cm, in the B mode, and is planning a setup with a 1.2 GHz for uplink and a 2.4 GHz for downlink, operating on S mode. Arturo XE1NAD is a contester; he created his own contest computer program. In his car, he has a dualband mobile rig for 144 MHz and 432 MHz. Arturo is also an excellent amateur photographer, and in martial arts he has a black belt, second *dan*. His E-mail address is: [arturo_enriquez@penoles.com.mx].

Arturo took me to the office of Luis XE1L, in a beautiful Spanish-style building surrounded by tall office buildings. It is easy to find Luis' building because it has a tower with a large yagi on the top.

Luis took me to see Lorenzo XE1U, who has a Ph.D. in civil engineering but works in insurance as the vice president of *La LatinoAmericana* (**Photo C**). Lorenzo is fluent in English, French, and Italian, and besides

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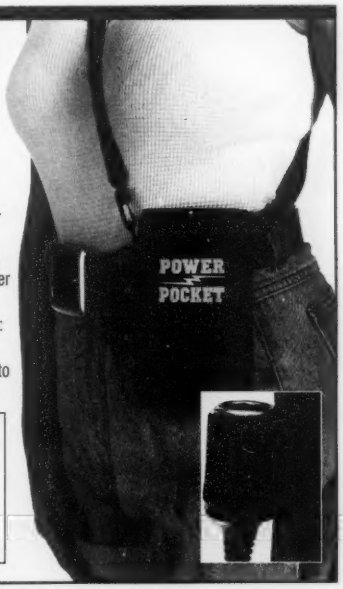

***Photo D.** Reyna XE1LMV and her mother, Olga XE1NBJ.*

Spanish, he also speaks a dialect used in the Canary Islands. Licensed in 1969, Lorenzo has a tremendous station, but is not a DXer; he works only SSB mostly with friends. His tower is 66 feet from the roof, 90 feet from the ground. On the tower Lorenzo has a 30-element, vertically-polarized yagi for two meters; a TA-33-40 yagi for 10-15-20-40 meters; a wire dipole for 40 and 80 meters; and three verticals for 144 MHz, 432 MHz, and 1.2 GHz. He likes 40-meter SSB. And to top it all off, he has a separate room just for constructing.

In Tepotzotlan, he has a second house with a complete station; an 82-foot tower with a 30-element yagi for two meters; a TH7DX type of antenna which is a seven-element yagi for 10-15-20 meters; a two-element yagi for 40 meters; and an 18HTS vertical from Hy-Gain for 10 to 160 meters. Lorenzo XE1U has a nice, colorful QSL card.

Thursday

For this day I had scheduled a visit with a ham who did not show up and did not even call to cancel the appointment. I went people-watching, and again to the two large artisans' markets. I prefer to shop where there are fixed prices; I really don't like haggling. As a dilettante in bargaining, I am no match for the professionals. No matter how much time I spend checking out prices and trying to push them down, after making the purchase, I always find better buys. That is the reason I prefer to do my shopping on the last day of my trip—at least then I don't see that I have made bad deals.

Some merchants spoke some English, but many of them, even after dealing for years with foreign—mostly American—tourists, knew very little. When asked about prices, they showed them to me on their calculators.

***Photo E.** Max XE1XA, with his antennas for satellite and EME communications.*

Friday

Today Emir XE1PAR came to the hotel and took me to his house. Emir is a retired medical doctor who worked as a hospital administrator. He was licensed in 1984. His daughter, Maria-Eugenia XE1PAT, is an architect living in Leon Guanahuato; they have QSOs every day on 40-meter phone.

Emir has a 40-foot tower on his roof, which itself is 33 feet from the ground. His antennas are: a six-element yagi for 10-15-20 meters; a Ringo for two meters; a Diamond for two meters and 70 cm; and a wire dipole with traps for 40 and 80 meters.

Emir XE1PAR has a second house in the state of Morelos, where he takes his Kenwood TS-440 or his Drake TR-3 to use with a wire dipole. Emir has QSL cards.

In the afternoon, I took a taxi to see Nellie XE1CI, who lives in a very high-class section of the town. The taxi driver stopped four times to ask for directions; twice he was sent the wrong way. To enter the building, I had to pass two security checks. When I got to the lobby and entered the elevator and pushed the button for the fifth (Nellie's) floor, the elevator went down instead of up because the lobby is on the eighth floor. That really can confuse a burglar!

If you talk about Mexican YLs or Mexican DXpeditioners, then you talk about Nellie XE1CI. She was licensed in 1968; her late husband Max XE1TX was also a very active amateur. Her three daughters and their husbands are also hams: Patricia XE1TX , who got her father's call; Debora XE1XYZ; and Lorena XE1XYW. They are not as active as Nellie XE1CI, but who is?

Nellie's tower is 165 feet from the ground and has a 30-foot mast. She has the following antennas: an omnidirectional two-meter vertical on the top; a 12- or 24-element (she did not remember exactly) vertically-polarized yagi for two meters; a TH11DX yagi from Hy-Gain for 10-12-15-17-20-30 meters; a Cushcraft two-element yagi for 40 meters; and an inverted-V wire dipole for 80 meters. Nellie XE1CI works on SSB, RTTY and satellite. She is on the No. 1 Honor Roll and has the 5BWAS with YLs only.

In Nellie's radio room, among all kinds of interesting ham memorabilia, I saw a dedicated photograph of JY1, King Hussein of Jordan.

Nellie has operated in many DX-peditions and from many locations, such as Easter Island XRØY; Revillagigedo XF4CI; Jordan YJ8XE; Israel 4X/XE1CI; Guantanamo Bay KG4CI; Puerto Rico XE1CI/KP4; Belize V31CK; Grenada J37NL; St. Pierre FP/XE1CI; British Virgin Islands VP2V/XE1CI; as well as in Venezuela; Germany; Sweden; Hilton Head Island IOTA NA-110; Isla del Carmen in XE3; etc., etc. Her E-mail address is: [xe1ci@mail.internet.com.mx].

Saturday

Manuel XE1JRI, whom I had just met at the *Radio Club Azteca* meeting, came to get me and take me to his house, where I met his spouse Olga XE1NBJ, and their pretty daughter

***Photo F.** Vic XE1VIC is on the Honor Rolls for Phone and Mixed, No. 1 Honor Roll, 5BWAZ, 5BWAS, etc.*

Reyna XE1LMV, who was just finishing college (**Photo D**). All three were licensed in 1992.

Manuel XE1JRI is the most active ham in the family; Olga XE1NBJ is mike-shy and Reyna is busy with her studies. They have a small station and a wire dipole for 40 and 80 meters, but no QSL cards. Their QSOs are virtually only with Mexican stations. The standard excuse for not working DX is that they do not speak a foreign language. This may be so in the case of Olga, but Manuel speaks enough English to be able to use it in QSOs, and Reyna's English is even better. Besides, there are a great number of countries in Central and South America where the hams do speak Spanish, so I wish the Mexican amateurs would get over this presumed language barrier and start to talk with the world.

Manuel XE1JRI is active in public service communications; he relayed messages after various hurricanes destroyed part of the public communications system. The Mexican amateurs have drills preparing them for potential disasters created by earthquakes, hurricanes, and the possible eruption of the Popocatepetl volcano. Once a year, Manuel participates in the Boy Scouts Jamboree demonstrating amateur radio communications to children.

We agreed to meet with Max XE1XA (**Photo E**) in a restaurant, halfway between Manuel's and Max's houses. They had never met before, but hams can always find each other. So we met, and I went with Max. First, we went to the house of Vic XE1VIC (**Photo F**). Vic is an accountant; he was licensed in 1978 and is one of Mexico's Big Guns. He has a very big station with lots of equipment. His tower is 75 feet high from the roof, 95 feet from the ground. It supports a TH7DX which is a seven-element yagi for 10-15-20 meters; a two-element yagi for 40 meters from Cushcraft; a G5RV for 10 to 80 meters; a Butternut vertical for 40-80-160 meters; a shortened wire dipole for 160 meters; and an inverted-L for 160 meters. He can also resonate his tower on 160 meters. No wonder he has over 100 countries worked on this band. Vic has a nice

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***Photo G.** Marisa XE1IRF and her daughter, Mariza XE1JVF.*

QSL card. What was surprising is that Vic does not use computers—he does not like them.

A member of the Mexico DX Association and Mexico DX Club, Vic XE1VIC is on the No. 1 Honor Roll, has both Phone and Mixed, and has 5BWAZ, 5BWAS, 160WAS, and scores of other awards difficult to obtain. He has twice gone on DXpeditions—to XF4 Revillagigedo and to 4J1 Malyj Vysotskij.

I saw that Vic's house, like many others in upper class neighborhoods, is protected by pulsating high voltage, among other devices. I wonder if that creates any radio noise.

After finishing at Vic's place, we went to see the station of Max XE1XA. Born in Italy, Max came to Mexico for a visit and then decided to stay. He manufactures medical equipment and various electronic parts and assemblies.

His tower is 40 feet from the roof, and 53 feet from the ground. It has an eight-element yagi for two meters and a TA33, a three-element yagi for 10-15-20 meters. His claim to fame is his satellite activities; he has made thousands of QSOs with over 100 countries using a 16-element cross-yagi for two meters, and a 40-element cross-yagi for 70 cm. Furthermore, Max XE1XA is known for his EME work. With his home-made dish, 16.5 feet in diameter with a 24 dB gain on 70 cm, Max has made hundreds of QSOs with 28 different countries. He has been a member of AMSAT since 1974, and has had articles published in the *AMSAT Journal*. His main interest is building equipment for very low level signals. Max has a nice QSL card.

In April 1989, Max XE1XA made the first satellite operation from Revillagigedo, making 521 contacts. He also operated via satellite during the Easter Island XRØY DXpedition, making 431 QSOs with 41 countries, uplink 70 cm, downlink two meters. He was part of the group who made the first six-meter EME contact from Easter Island.

Max's E-mail address is: [coramexsa @supernet.com.mx].

I returned to my hotel to rest, but then I got a call from Manuel XE1JRI that he had found some more hams willing to be photographed. I could not miss the opportunity. Manuel came over and drove me to the home of Roberto XE1NDN, an orthopedist. A family of four, all hams! Roberto XE1NDN was licensed in 1990; his wife Marisa XE1IRF, a kindergarten teacher, licensed in 1992; his daughter Mariza XE1JVF, a university student studying business administration, licensed in 1992 (**Photo G**); and son Roberto XE1JRS, a salesman, licensed also in 1992. I have noticed the tendency in many families to give the children the same first names the parents have.

Roberto XE1NDN was saying that he has to have three jobs to support his family. I told him that in the US medical doctors make quite a lot of money, and the best season for orthopedists is winter, when people slip and fall on ice, and break some bones. In Mexico, there is little chance for ice. "Oh," said Roberto, "Santa Patineta takes care of us orthopedists!" He was referring to accidents caused by children on roller skates.

Here I found hams acting more like CBers: no logs; no QSLs; only short distance contacts, mostly with friends, without trying to extend their radio communications to faraway places in other countries. Again, the unjustified excuse was that they don't speak foreign languages. Roberto XE1NDN has a computer, but does not use it to its full capabilities, for example, to log his QSOs. After taking their pictures I returned to my hotel wishing I could go home—but according to my schedule and airline tickets I had two more days to stay.

Sunday

In the morning I went with Theodoro XE1YQQ and Rosa XE1YQR to a big market which had two distinct sections: one with the usual new clothing; and the other one, a real flea market with genuine antiques which I have rarely seen in other places. I did not buy anything, but it was fun to look at them.

In the afternoon, all three of us went to *Palacio de Bellas Artes*, a few blocks from my hotel, and saw four very well executed and imaginative modern dances presented by the *Compania Nacional de Danza*. I especially liked the ballet created to the music by Georges Bizet, on the theme of Carmen. It was fantastic. The best seat in the house costs about 14 dollars.

The Palace of Fine Arts, an architectural masterpiece, had a painting exhibition with the works of Diego Rivera, his wife Frida Kahlo, Siqueros, Orozco, and other great Mexican artists.

Monday

The end of my trip was approaching. I did the last-minute shopping and I took everything I bought to Theodoro's hardware store, where they packed it in two cardboard boxes that were later taken to my hotel.

During the last few days, I had gotten sick of the spaghetti I had eaten almost daily. I had not wanted to adventure in typical Mexican food, so I had bought in the market the bread, cheese, and tomatoes that I would eat three times a day.

I noticed some peculiarities in Mexico City. The subway, which has a very extensive network, is very cheap: 1.5 pesos, which comes to 18 cents. However, the highway tolls are much too expensive. Going to Cuernavaca we paid 50 pesos each way for about an hour's drive.

On the streets of Mexico City, especially in the business districts, there are men with red flags, some with a large letter E, others without it or just with a piece of rag, jumping around and waving their flags to get the attention of the drivers and attract them to

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their parking garages. The letter E stands for *estacionamiento*.

Buses and minibuses often have a man standing in the open front door yelling out the route and inviting passengers to get on.

The traffic is tremendous and noisy, with impatient drivers blasting their horns, cops blowing their whistles, and scores of cars crossing the intersections after the lights turn red.

Tuesday

I took a whole-day tour going to Puebla and the pyramid of Cholula. Puebla has 3,000,000 inhabitants. There we visited the Hidden Convent of Santa Monica, filled to the brim with religious paintings and carvings. Just on the two tours alone that I have taken, I have been to so many churches, chapels, and convents, and bowed my head in front of so many crosses and various saints, that I now believe I have earned my place in Heaven.

As usual, the guide took us to a "factory," this time to a "Talavera ceramic factory." During my travels, when I took tours I was taken to many, many "factories" but never saw a worker; the "factories" were just stores only for foreign tourists, where the guide gets a commission on everything his group buys, and that makes the prices higher than if you shop by yourself.

Another bit of information: For absolutely the same tour, various travel agencies charge different prices. For example, I found three brochures from three agencies asking for the above tour $35, $43, and $46. Why do I say that it is the same tour? Because instead of sending three buses with three drivers and three guides, they combine everybody in a single bus, no matter where you booked the tour and how much you paid. I paid $43 (silly me) and a guy sitting near me paid $35. So, collect all the tour brochures you can find, decide on a tour, and book the cheapest one.

Wednesday

I had return tickets for an afternoon flight, but I went to the airport early in the morning and changed my tickets for an earlier flight. I had kind of finished my job and run out of money, and it was very hot. I was anxious to get home.

At the Dallas/Ft. Worth airport, I had to pass immigration and customs and change planes. I was the lucky winner of perhaps a random selection by the customs officials and they checked not only all three pieces of my luggage, but also I had to hand them my jacket for inspection. They examined it carefully, even the books I was carrying: *DX-Aku, Messages from the Easter Island Expedition*; and *VKØIR*; both by KK6EK, received as gifts from Luis XE1L.

I believe it was not a routine customs inspection. Initially I had had the intention of taking a side trip to Cuba to visit some hams, and that is forbidden because of the embargo. I had told this

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to a couple of people. Perhaps word got around and the authorities were waiting for me. I certainly do not match the profile of a smuggler, and they could have brought their sniffing dogs to check me out. But the dogs wouldn't find any proof that I was in a forbidden place. For that, sniffing people were needed. Let me express my restrained opinion about the embargo: it is completely useless, and is restricting the freedom of US citizens to travel wherever they want.

I truly enjoyed the trip, despite the unusually hot weather. I met really nice amateurs and non-amateurs alike. Mexico has everything—and even more than you could expect on a vacation. And you don't even have to cross the pond to get there; it is right in our own backyard! 73

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Low-Voltage Detector

continued from page 31

sounder was rejected in this application even though the circuit is capable of driving a Sonalert™ or similar sounder.

An LM741 op amp was chosen to be used as the detector because of its availability and low cost, not for any specific technical reason. Yes, a voltage comparator, which was designed for the purpose, would work equally as well in this application. As a matter of fact, if you decided to use a voltage comparator, there would be no changes to the circuit except for the device pin numbers.

A zener diode is used to establish a stable voltage reference at a convenient voltage level between 4.5 V and 8 V and is connected to pin 3 of the LM741. Also, the voltage at pin 2 of the LM741 must be adjustable above and below the zener value in order to achieve a detection threshold level. The voltage value on pin 2 normally remains higher than the voltage on pin 3, and as long as it is higher, the output at pin 6 will remain low. Potentiometer R2 is adjusted to allow the voltage at pin 6 to rise when the supply voltage falls to and/or below a selected level. In my friend's situation the threshold voltage was set for 11 volts. At that value his critical functions would still continue to operate while the flashing LED would provide a warning of a potential failure.

Although turning on a light *is* a warning, a steady glow might not be noticed. A flashing light has a much better chance of attracting attention to a potential problem. To make a flashing light, a 555 IC was used as a low-frequency oscillator for controlling the LED on/off function. An LED with a built-in flasher would perform just as well in this application, and would simplify the circuit by eliminating the 555. The actual flash rate is not critical as long as it attracts attention.

There is nothing critical in the construction of the low voltage detector. Adjustment of the threshold is performed by attaching the detector to a variable voltage power supply. The output of the supply is adjusted to the desired detection voltage threshold value. Then, R2 on the detector is adjusted until the LED begins to flash. The correct setting is then verified by raising the supply voltage slightly above the threshold until the LED stops flashing. The supply voltage is then lowered until the LED starts flashing again.

The low voltage detector can be used for a wide variety of applications—you are limited only by your imagination. It's suitable for use on any battery-operated system subject to a voltage loss situation, including an automobile. Build the circuit and try it out on your 12-volt battery and/or power supply system. 73

Parts List

R1	1 k 1/4 W resistor Jameco #29663
R2	10 k pot Jameco #43001 Hosfelt #38-120, #38-145, #38-192
R3	4.7 k 1/4 W resistor Jameco #31026
R4	100 k 1/4 W resistor Jameco #29997
R5	33 k 1/4 W resistor Jameco #30841
R6	330 1/4 W resistor Jameco #30867
C1	1 µF 50 V radial cap Jameco #29831 Hosfelt #15-550
Zener	1N4734 (4.5–8 V) Jameco #36118 NTE #5013A
U1	LM741 op amp Jameco #24539 Hosfelt #LM741CN RS #276-007
U2	555 timer Jameco #27422 Hosfelt #NE555
LED	red LED Jameco #94511, #94529, #104248 Hosfelt #LO1, #25-307, #25-325 RS #276-041

Table 1. *Parts list for the low battery voltage detector, including part numbers of suppliers.*

SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the March '99 issue, we should receive it by December 31. Provide a clear, concise summary of the essential details about your Special Event.

JAN 2

MORRISTOWN, TN The Lakeway ARC will host a Hamfest and Computer Show on Jan. 2, 1999, at the Talley Ward Rec. building in Morristown TN. For info please contact *Perry Hensley N4PH, (423) 828-4848, E-mail [n4ph@juno.com]; Kemp Lawson KF4AGB, (423) 587-3320, E-mail [kemplawson@aol.com];* or write to *Lakeway ARC KF4JJJ, P.O. Box 895, Talbott TN 37877-0985.* Talk-in on 147.030(+) and 53.030(-).

JAN 16

ST. JOSEPH, MO The Missouri Valley ARC and Ray-Clay ARC will hold their 9th annual Northwest Missouri Winter Hamfest 8 a.m.–3 p.m. at the Ramada Inn, I-29 and Frederick Ave. (Exit 47 on I-29), in St. Joseph MO. There will be special room rates for hamfest participants. VE exams, major exhibitors and flea market all indoors. Free parking. Advance tickets $2 each or 3 for $5; at the door $3 each or 2 for $5. Pre-registration requests received after Jan. 5, 1999, will be held at the door. Dealers: Swap tables $10 each for the first two tables. Commercial exhibitors welcome, write for details: *Northwest Missouri Winter Hamfest, c/o Gaylen Pearson WBØW, P.O. Box 1533, St. Joseph MO 64502, or E-mail [WBØW@IBM.Net].*

JAN 17

HAZEL PARK, MI The Hazel Park ARC will hold its 33rd Annual Swap & Shop on Jan. 17, 1999, at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. The public is welcome 8 a.m.–2 p.m. General admission is $5 in advance or at the door. Plenty of free parking. Tables $14; reservations for tables must be received with a check. No reservations by phone. Talk-in on 146.64(-), the DART rptr. For info about the swap, tickets, or table reservations, mail to *HPARC, P.O. Box 368, Hazel Park MI 48030.*

SPECIAL EVENT STATIONS

DEC 13

AURORA, CO The Second First Annual Great Colorado Snowshoe Run, sponsored by the Colorado QRP Club, will be on the air 0300Z–0500Z December 13th, 1998. This equals Dec. 12th in the following time zones: 7 p.m.–9 p.m. Pacific; 8 p.m.–10 p.m. Mountain; 9 p.m.–11 p.m. Central; 10 p.m.–12 midnight Eastern. 40 meter CW only, 7.040±. Power: 5 watts maximum for all entrants, but QRO stations can be worked for credit. Certificates will be awarded to the highest scoring station in each antenna class, and the highest scoring station in each SPC. Full details are on the CQC Web site at [http://www.cqc.org], or E-mail [cqccx@cqc.org]. Up to three contacts with the same station are allowed, 30 minutes apart. Logs must be postmarked or E-mailed no later than 30 days after the event. Mail to Colorado QRP Club, Inc., P.O. Box 371883, Denver CO 80237-1883, or E-mail (ASCII text files only) to: [cqccx@cqc.org].

JAN 26–27

ST. LOUIS, MO All Amateur Radio Clubs of St. Louis MO will sponsor Special Event Station WØK during the papal visit of Pope John Paul II, Jan. 26–27, 1999. Operations from the Monsanto Amateur Radio Assn. shack will be on 10–80 meters, 24 hours per day. QSL with #10 SASE via *Rev. Mike Dieckmann KAØIAR, 703 Third St., Hillsboro MO 63050 USA.*

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C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
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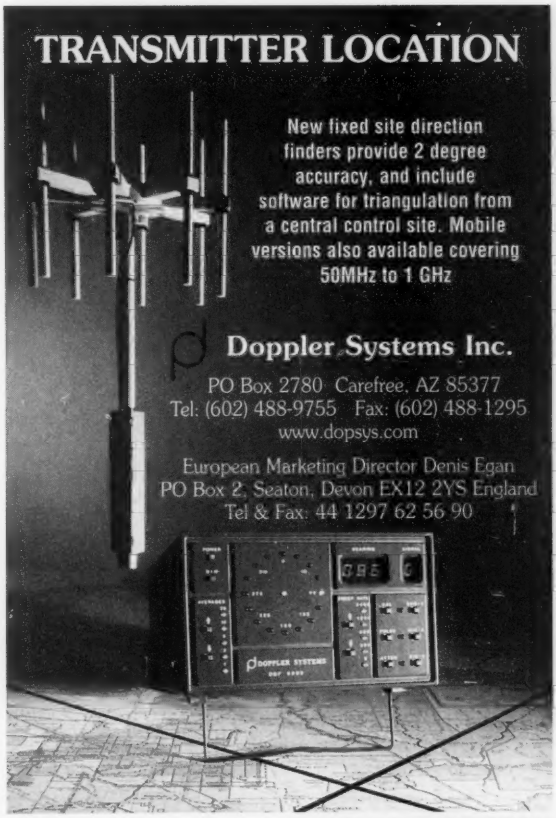
HP power meters and thermistor mounts: Evaluating surplus material

Due to several requests for an overview covering Hewlett-Packard and similar microwave power meters, I will re-explore power meters and how to evaluate them at a swap meet to attempt to avoid spending big bucks on a defective unit. Most important is the evaluation of the power head, as this is the most important piece of equipment in the evaluation equation.

There are several tricks of the trade that can be brought to bear to evaluate surplus material "on the fly" at swap meets and other events we microwavers delight in. For one thing, I usually carry (in the glovebox of the car) a suitable set of simple tools to help in testing should the opportunity present itself.

The first item I want to cover is just what to pay for surplus power meters and—most important—the RF head and connecting cables. Other questions to answer include what conditions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CIRCLE 13 ON READER SERVICE CARD

to expect and how you know if something is in working condition. I know we need a set of test parameters through which to put a device to avoid the purchase of another doorstop. Well, I can't guarantee you that these pointers will be 100% perfect, but perhaps they will help to minimize any aggravation.

I am basing my observations here on the Hewlett-Packard 431-type power meter with matching RF cable and 478-type power meter head, which is the most common. There are several other types of meters, such as those by General Instruments. I picked the Hewlett-Packard 431 because it is an inexpensive surplus meter that seems to be prevalent on the surplus market.

When you happen upon a power meter at a swap meet or flea market, it's kind of hard to really evaluate it in its operational state unless you have AC power and a source of RF to fully test it. However, there are some basic operations you may perform on the unit to determine if it is indeed "alive."

In this example, our HP-431/HP-478 system should be able to measure frequencies from 10 MHz to over 12.4 GHz with ease and accuracy using the "N" coaxial connector of the 478A power head. Other heads are available with waveguide instead of coaxial input connectors. The 478A coaxial head is the most popular, as it has the most common frequency range of use. However 10 and 18 GHz waveguide heads are very good also.

The division of cost can be split up into the three components of the HP-431 power meter system. First, the meter itself is valued at $25 to $40; it is readily available as a stand-alone device—but it is useless without the control cable and power head (478A), which are the two more expensive parts of the systems. The RF head cable is valued at $40 and the power head, type 478A, slightly higher at $50, making a package price in the $150 range somewhat common. I have seen meters with cables and 478 heads priced at over $200, but they still reappear month after month with no one purchasing them at swap meets here.

Don't rush to pick up a meter. First get a cable, and if you want to check it, a simple ohmmeter check of continuity will do the job. I have never found a surplus cable defective—just very dirty, and sometimes with cracked cable covering (fixable with a little black electrical tape). Didn't look very swift, but it functioned well. If you're a purist, get some gray electrical tape and do the best you can.

Recently I evaluated three power heads with a waveguide input for the frequency range of 12.4 to 18 GHz and found only one suitable for purchase. I also applied the same techniques to evaluate seven coaxial General Microwave power heads and found them all defective. They all carried sticker prices of $40 each—not too bad for a doorstop. Just don't let your pick-it-up-itis get in the way of reason—evaluate what you are contemplating purchasing.

The cost of a complete power meter package with cord and thermistor mount should be less than $200. A setup like this can measure power from 10 MHz to over 12.4 GHz with ease and accuracy, using a terminating "N" coaxial connector. I have also seen systems go for a lot less, with $125 or so being more commonplace. Remember, there are a lot more 431-type meters around than cords and the scarce thermistor heads. Thermistor heads can go for $80 to $100 each depending on condition (appearance). If you're desperate and have a bankroll, well, judge it for yourself. I would purchase a lower-priced head providing I could test it with an ohmmeter. Used, good, checked-out-but-grungy-appearance heads demand the lower figure, while new checked-out heads command the top price at swap meets. This is somewhat backward from a calibration standpoint, which would make more sense to me.

Evaluation at swap meets can be difficult, but if there is AC power you can plug in the meter and see if you can make DC balance with the RF head attached. (Set the meter's resistance switch on the front panel to 200 ohms when using the 478A RF head.) Adjust the meter balance controls for zero indication using both the coarse and fine balance potentiometers. Usually, if a power meter will balance, it's in reasonable condition.

While in the AC power mode, pull out your little RF test generator to make an on-scale reading. It's a single TTL high frequency crystal oscillator module and its 9 V transistor radio battery. The unit I built is quite small, and only uses eight components, including a crystal oscillator module, a nine-volt battery, five-volt zener with load resistor, and three resistors in the output attenuator circuit to limit output to zero dBm or so.

If AC power is not available, you can still confirm several good test conditions to determine if it indeed is a bargain. What you want to determine is whether the RF thermistor head is "alive." To accomplish this, we make a DC resistance check of the thermistors in the 478A thermistor mount. For these measurements, you need an older-style POVM—that's a Plain Old Volt Meter, or more exactly a VOM, analog- or digital-type. The new digital types work, but with autoranging you don't get repeatable results. What is desirable is a range setting like x10 that does not provide high current output like the x1 scale, or the higher voltages used when in the megohm ranges. The times ten scale of an analog resistance meter (VOM) is perfect.

Make a DC resistance check between the shell (ground) of the HP-478A thermistor head and the pins that would connect to the meter's cord. You will find one pin open and three pins connected to ground. The remaining two pins are direct connections to the thermistor leads. Pins 1 and 3 are the thermistor's to-ground. Pins 2, 4, and 6 are grounds. Pin 5 is open. One of the thermistors is the actual RF thermistor that responds to RF power, and the other is isolated and is used to provide temperature stability balance to the bridge circuit. Both thermistors must be matched to balance the power meter bridge circuit. I measured on my bench this way and got 3.22 k ohms on pin 1 and 3.75 k ohms on pin 3. This unit just would not balance on the power meter. A better head measured 2.96 ohms on pin 1 and 3.01 ohms on pin 3 and balanced perfectly with lots of balanced range.

In desperation, heads can be fixed by adding some extra balanced resistance to the part of the thermistor circuit that is unbalanced (inside the 431 meter). Of course, calibration will be affected, but you get a balanced unit when there is no other possible fix available. It's not too bad, considering the alternative without any meter at all. This is a drastic last step to tide you over until you can get a good balanced head—one that will give you some service until that time. Just remember that if the difference is too great, the unit will not balance on the HP-431 power meter.

Now, what follows is not a Hewlett-Packard thermistor selection process but rather a simple, quick, and easy-to-perform DC resistance check. The resistances of the thermistors should be quite close in relationship to each other. Nominally, I have made readings near the 3000-ohm area using a 1000-ohm-per-volt VOM, a Radio Shack $10 special. The specific resistance is not important—just that the thermistors are in the range and close to each other. What is critical is the match between the two thermistors.

I have observed some power head thermistors read 2.758 ohms and 2.786 ohms, 1320 ohms and 1285 ohms, 3.956 ohms and 3.984 ohms. Others I have tested all showed being in the vicinity of each other (let's say to less than 5% or so). If this match is

quite close, the head should work. Out of 25 or so heads verified in this manner, only two showed problems. One was temperamental in that it showed instabilities like a microphonic connection, and the other one was 5 dB off in calibration and not linear. The other units evaluated out of a batch of some 75 heads considered over many years were not suitable for further evaluation. Most had one thermistor open or the match was quite bad.

Examples of bad thermistor heads

A bad or defective thermistor head is one that has one thermistor open, usually the RF detection thermistor. In an HP-478A mount the maximum RF power to be detected is 10 mW. I usually suspect that 10 *watts* or some excessive power above 10 mW caused the thermistor to go up in smoke ... Usually the RF head will handle an over-range input of +20 mW for a short time, but you are "tickling the tail of a dragon" if you try.

Over-range input power also has caused matched thermistors to heat up excessively and change their resistance values, rendering a previously matched set of thermistors unmatched due to excessive RF heating. The result is a head that will not zero-calibrate and is considered smoked just as much as one that is open for all practical purposes. When this happens, you will not be able to balance the meter, rendering the RF head useless.

Checking the thermistor heads in this case, you might obtain DC resistance readings that vary according to the type of meter you use. Just be sure that the two thermistors are somewhat close to each other and you should be OK. 200 ohms imbalance should be OK, but as it gets higher, suspect trouble. If the price is low, give it a try. If the price is quite high, I would avoid heads that are over the 200-ohm range unless you can test them on a workbench or get a return guarantee. The resistance must be less than 200 ohms difference to be able to bring the HP-431 power meter to balance. 100 ohms on the HP-432 proved to be OK, but I could not find any over 200 ohms to test on my bench meters to confirm my resistance speculation.

The pinout is the same for many different manufacturers besides Hewlett-Packard that also make the 431-type power meters. I suspect most are authorized duplications made under contract to HP but carry other designations and are physically identical to the HP-478A thermistor heads. Most were manufactured by Struthers and other manufacturers. Recently I picked up an 18 GHz waveguide head that was manufactured by PRD. It was strikingly similar to the HP types. Even the connector seemed identical, so I tried the old POVM meter I carried in the car glovebox and put it to a test. Out of three tested, only one proved to be any good in matched thermistors.

Two other units tested with both thermistors showing continuity, but their resistance readings seemed at the edge of my tolerances. I talked the surplus store into letting me take the two heads on credit, to be returned that day, if a home test proved them not compatible with the HP meter system. Well, I am happy to report that the one PRD head that tested within close tolerance balanced and reads quite accurately. The other two heads that seemed to be at the edge of my tolerances would not balance and were returned to the surplus store. Did not want to make a costly mistake again.

Terminations and RF attenuators

The other components needed to make good power measurements into the microwave region are a good set of various attenuator values. Usually a set includes 3, 6, 10, 20, and 30 dB two-watt attenuators or, as more commonly called, pads. Two things are important in selecting or paying a price for a pad. Pads are rated in frequency and attenuation. If you intend to use a pad at 10 GHz, make sure that it is rated for operation at this frequency.

Usually, the attenuation and frequency characteristics are printed on most pads. If it is not, you are on your own as far as frequency is concerned. I have had some very high quality pads that looked top of the line, but as far as performance was concerned, they became screwball and nonlinear as to attenuation when the frequency increased beyond 6 GHz.

At 10 GHz, this particular pad exhibited some 35 dB of loss; at 8 GHz, loss was 32.4 dB; and at 6 GHz, it measured 30 dB. Decreasing frequency, the 30 dB loss maintained stable. This showed that this pad was not designed for operation at all above 6 GHz. By the way, it did not have any frequency marking or rating on it. I have tested HP pads that are rated to 12.4 GHz; they are quite good even far above their 12.4 GHz frequency limits.

The other rating that is important is the loss value of the pad. Here we can make some determination just if the pad is OK. Enter the handy VOM again. An attenuator or pad is usually constructed in a "T" fashion, giving equal resistance to both the input and output coaxial connectors with respect to ground. Usual construction comes in the form of a small cylindrical input and output resistor forming the center conductor of the "T" pad. The shunt or center resistance to ground is a very large diameter resistor connected at its center to the two input/output resistors. Being circular in design, its outer edges are connected to

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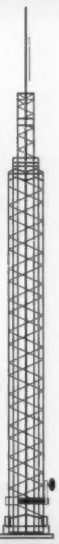

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Hybrid couplers are an interesting class of devices. The most interesting property is that they will split an input power two ways. Each of these outputs receives -3 dB of the input power (i.e., a two-way split). Some hybrids produce in-phase outputs, others (called "quadrature" hybrids) produce 90-degree outputs, and others produce 180-degree (out of phase) outputs. There are a number of devices that are useful, but among those that I find most interesting are the Magic-T devices. In this month's column we will take a look at the fascinating Magic-T. The Magic-T produces 180-degree out of phase outputs.

The Magic-T transformer

Fig. 1 shows the Magic-T transformer hybrid. It consists of one center-tapped winding and one non-tapped winding. Which of those windings will be used as the input or output depends on the application. The relationship of the impedances is shown in **Fig. 1**. The system impedance, R_o, appears at the ends of the center-tapped winding (Port-2 and Port-3), while the impedance at the tap (Port-4) is $R_o/2$. The impedance at the ungrounded end of the non-tapped winding (Port-1) is $2R_o$.

Let's take a look at two situations. First, a signal is applied to Port-1. If Ports 2 and 3 are properly terminated in the system impedance, then the power will split 3 dB to each port, but the voltage appearing at the two ports is 180° out of phase. Port-3 is thus 180° with respect to Port-2. Both Port-2 and Port-3 are -3 dB with respect to the input level. Because Port-4 is the common between ports 2 and 3, the voltage is zero, so Port-4 is the isolated port.

The next case would be a signal applied to Port-4. This signal is split two ways, -3 dB each to Port-2 and Port-3. The signal at Port-1 will be zero because equal but opposite currents from Port-1/Port-2 and Port-1/Port-3 are induced into the untapped winding, thus canceling each other.

Practical 50-ohm example

The combiner/splitter shown in **Fig. 2** is designed to 50-ohm systems, so the tap is terminated in a 25-ohm noninductive resistor. The input is the non-tapped winding. In order to reduce the 100-ohm impedance that one would expect from the previous case, where the turns ratio is 1:1, the turns ratio is adjusted to 1.414:1, although in practice a 1.5:1 ratio is normally used. This transforms the impedance to close to 50 ohms.

Transformer matched Magic-T

A different approach to input impedance transformation is shown in **Fig. 3**. The circuit is otherwise similar to the previous circuit, except that the transformer turns ratio is the same as the straight Magic-T, i.e., 1:1. A second transformer, T2, is used to transform the 100 ohm impedance reflected from the tapped winding to 50 ohms. Transformer T2 is an *autotransformer*, a transformer made with a single tapped winding rather than two windings. The tap is placed at the two-thirds point from ground.

Construction

The Magic-T can be built for any power level using appropriate toroidal ferrite or powdered iron cores for transformer T1. For receive-only Magic-Ts you can use cores such as the T-50-2 and T-50-6 in the 1 to 30 MHz high frequency (HF) region, or T-50-15 in the 100 kHz to 15 MHz medium wave region. For receiver applications use #24 AWG or #26 AWG enameled wire.

For QRP transmitters, you can use a core of the same material (the "dash number" in the type numbers above), but you should increase the size to something between the 100 (1-inch) and 240 (2.4-inch) sizes. Use wire of #22 AWG to #18 AWG, or larger if power levels are more than a few watts.

If you build one for transmitting at higher power, then you will need to use one of the larger hybrids commonly found on high power balun transformers. Also, scale the wire size up according to the power level used.

One of the applications of this type of coupler is to combine the signals from two antennas. Although any type of antenna can be used, let's consider the case of the quarter-wavelength vertical spaced a half-wavelength apart. These can be fed either in-phase or 180 degrees out of phase, depending on the direction that you want to squirt signal. A high power Magic-T and some switching can be used for feeding the antenna.

Why? One fellow told me that he would simply use a half-wavelength extra of coax to the 180-degree antenna, and that would take care of the phase shift. Yes, it would, but it also distorts the pattern. Loss in the coaxial cable means that the two antennas will receive different currents, and that messes up the radiation pattern. By using the Magic-T device you can use equal lengths of identical coaxial cable to the two antennas. If you want to feed them in-phase, then don't use the Magic-T. But if you want to feed them out of phase connect the Magic-T into the circuit such that Port-2 and Port-3 go to the two antennas, and Port-1 goes to the transmitter.

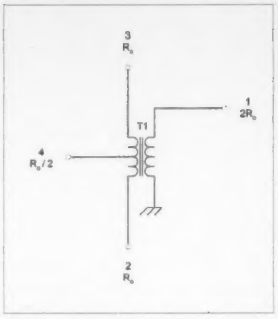

Fig. 1. Magic-T transformer hybrid.

Other matters ...

Several readers over the past year have asked me about the availability of small parts. Too many distributors require a high minimum order or won't deal with amateurs at all. The list below is compiled from the information I have available of outfits that sell small quantities of small parts at reasonable prices. Contact me if you know of others.

Parts suppliers

Small Wonder
Dave Benson NN1G

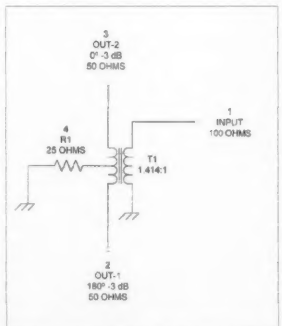

Fig. 2. Combiner/splitter.

ground and it acts as a shield between the input and output of the pad.

Well, I hope I have given you some good information with which to evaluate power meters and power meter heads. Good hunting at your next swap meet! 73, Chuck WB6IGP. 73

HAM TO HAM

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Dave Miller NZ9E
7462 Lawler Avenue
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High-tech cleanup

Here's a handy little gadget that I ran across recently at the hardware store. It's called a PrepPen®, and it's made by Pro Motor Car Products of Clearwater, Florida. The intention of the manufacturer is that the PrepPen be primarily used for fine-detail standing, such as those hard-to-get-at contours in fancy millwork, or the small recesses in metal castings that are otherwise inaccessible to normal sandpaper and other grit-based materials.

In fact, Pro Motor Car Products bills its PrepPen as "The High-Tech Sanding Tool." While cleaning wire ends prior to soldering is mentioned on the package, I've found that the PrepPen can be used for all manner of electronic cleaning jobs around the shop. In addition to sprucing up highly corroded wire ends, it's also handy for burnishing terminal connections, PC board solder pads, corroded portable-equipment battery contacts, soldering-iron tips, and anything else that needs fine touch-up cleaning prior to use. While the PrepPen will remove some of the softer enamel-wire finishes, it won't work (by itself) on Formvar® and others that are extremely tough. They'll still need to scraped. It can, however, be used for the final, just-before-tinning, cleanup.

Physically, the PrepPen is about the diameter of a husky marking pen, which makes it easy to handle and control. Its plastic pen-shaped body houses a bundle of 20,000 very fine strands of glass fibers (each finer than a human hair), attached to a screw-thread feeder cartridge. You can adjust the length of the fibers exposed from the working end of the "pen" by simply turning the adjusting post at the far end.

Fig. 1(a) shows the overall concept of the PrepPen, and **(b)** how the glass-fiber replaceable cartridge (about an eighth of an inch in diameter) itself looks. Some of the other jobs that the manufacturer mentions (in addition to cleaning ends of electrical wires) are removing corrosion from plumbing parts; brushing rust from small areas of chipped paint prior to touch-up (such as on an automobile); sanding hard-to-get-at recesses prior to painting; preparing parts for gluing (it dulls a shiny finish nicely); and cleaning battery contacts.

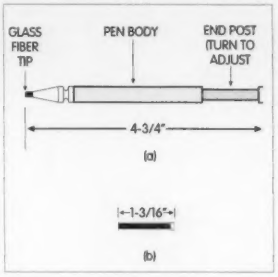

Fig. 1. The PrepPen® by Pro Motor Car Products features a replaceable glass-fiber cartridge and can be used for a number of fine-detail cleaning jobs on your ham radio workbench.

[We recently had occasion to try to remove some silk-screening from the front of an older rig, in order to change it according

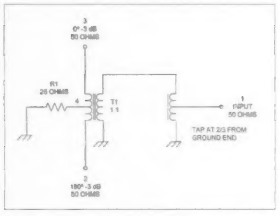

Fig. 3. A different approach.

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[sales@kanga.demon.co.uk]

Reading list

Another thing people ask me about is books on RF and related topics (such as antennas). I immodestly recommend a couple of my own, but the list is below. Use it for what it's worth.

1. *Introducing QRP*: Dick Pascoe GØBPS, £6.95, US$15.
2. *Pascoe's Penny Pinchers*: Dick Pascoe GØBPS, £4.95, US$8.
3. *QRP Notebook*: W1FB (ARRL).
4. *W1FB's Design Notebook*: (ARRL).
5. *W1FB's QRP Notebook*: (ARRL).
6. *Your QRP Operating Companion*: KR7L.
7. *How to Get Started in QRP*: K4TWJ.
9. *The Joy of QRP*: WØRSP.
10. *Practical Antenna Handbook, 3rd Edition*: Carr, Joseph J. McGraw-Hill, New York (1998).
11. *Microwave and Wireless Communications Technology*: Carr, Joseph J. Newnes, Boston (1997).
12. *Secrets of RF Circuit Design, 2nd Edition*: Carr, Joseph J. McGraw-Hill, New York (1996).
13. *Radio-Frequency Electronics: Circuits and Applications*: Hagen, Jon B. Cambridge Univ. Press, Cambridge, UK (1996).
14. *High Frequency Circuit Design*: Hardy, James. Reston Publishing Co. (Division of Prentice-Hall), Reston VA (1979).
15. *Standard Radio Communications Manual, with Instrumentation and Testing Techniques*: Kinley, R. Harold. Prentice-Hall, Englewood Cliffs NJ (1985).
16. *Practical Microwaves*: Laverghetta, Thomas S. Howard W. Sams, Indianapolis IN (1984).
17. *Microwave Devices & Circuits*: Liao, Samuel Y. Prentice-Hall, Englewood Cliffs NJ (1990).
18. *HF Radio Systems & Circuits, 2nd Edition*: Sabin, William E. and Schoenike, Edgar O., editors. Noble Publishing, Atlanta GA (1998).
19. *Electronic Communication, 3rd Edition*: Shrader, Robert L. McGraw-Hill, New York (1975).
20. *RF Design Guide*: Vizmuller, Peter. Artech House, Boston/London (1995).
21. All of the ARRL's books.

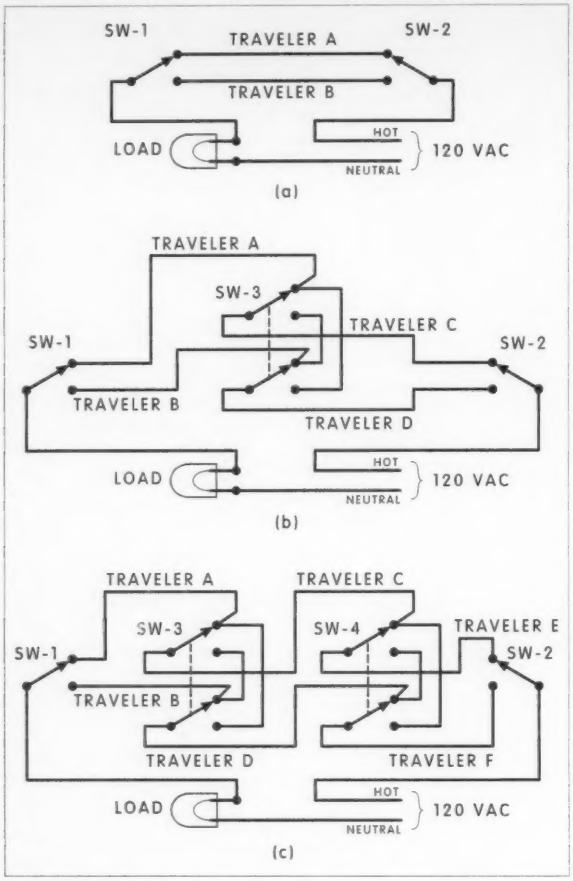

Fig. 2. *(a) Well-known three-way switching configuration. (b) Four-way switching configuration allowing On/Off control from three distinct locations. (c) Four-way switching configuration allowing On/Off control from four, five, six or more distinct locations. Note: "Travelers" are defined as conductors between switches.*

to a mod we had done. Some sly testing showed that nothing—including rubbing compounds and soft abrasives—seemed to work without affecting and marring, however slightly, the underlying finish. Nothing, that is, until retired Grumman Corp. technician Stanley Rasanen of Nesconset NY pulled an ancient fiberglass pen out of his junkbox, hoarded since the '60s, and suggested using it as an eraser. Same idea as the PrepPen, and worked great for this.—Ed.]

The PrepPen measures four and three-quarters inches long and is about nine-sixteenths inches in diameter at its widest points. The glass-fiber cartridge is one and three-sixteenths inches long, and, of course, wears down as the tool is used, but it still should last a reasonable amount of time before needing replacement. With my PrepPen, the manufacturer had thoughtfully packaged one spare cartridge in the hollow of the rear adjusting post (the unit easily comes apart for cartridge replacement). The PrepPen is available at most automotive, hardware, and home-center stores nationwide.—de NZ9E.

Analyzing ... the problem!

From Stephen Reynolds NØPOU: A word (or several) of caution: "Using an RF antenna analyzer to determine the accuracy of the match for an HF antenna can sometimes be misleading ... especially if a strong local broadcast station is on the air in the area. Strong RF fields can throw the analyzer off because it can't distinguish between locally strong out-of-band signals and the signal that the analyzer itself is developing."

Interesting point. Stephen also mentioned that you must be very careful when connecting the coax connector onto the Autek RF Analyst®. Any twisting of the connector's center pin, during installation or removal, can break connections on the inside of the unit, necessitating time-consuming (and perhaps costly) repairs. His answer to the problem was to permanently install a UHF right-angle adapter onto the Autek's UHF fitting, and only install the coax cable connector to that right-angle adapter, thus absolutely avoiding any twisting of the instrument's built-in coax fitting during normal usage. Good tip, Stephen.

Stay in control

From Jim Kocsis WA9PYH: How to control just about anything that you'd like to turn on and off, from as many locations as you can imagine: "If you need to control a circuit from several different locations, then this may be just the thing you've been looking for! Using two SPDT switches to control a circuit from two distinctive locations is no big secret ... so-called three-way circuit switching has been used for years in the electrical trade and it's likely that you now have one or two lighting circuits in your home controlled by three-way electrical switches. **Fig. 2(a)** shows how the circuit is wired, and of course it's used to turn the same lights on or off from two different places. But what if you want to have more than two different control locations?

"Electricians use four-way switches (DPDT switches that are crosswired internally so that only four of the six terminals are brought outside) to accomplish just that task. **Fig. 2(b)** shows how it's done. SW-1 and SW-3 are SPDT three-way switches and SW-2 is a DPDT internally crosswired four-way switch. No matter what position any of the switches ends up being left in, at any of the locations, the circuit can be turned on or off from any other location.

"Now take a look at **Fig. 2(c)**. Here we see two SPDT three-way switches and two DPDT crosswired four-way switches. This combination allows us to control our circuit from any of four distinct locations, again, regardless of what position any of the switches is left in at any of the other locations. In fact, just by adding more DPDT crosswired four-way switches, you can control the circuit from as many positions as you wish (just remember that you need to end up with the SPDT four-way switches at each end of the circuit as shown).

"In addition to using this scheme to control a lighting circuit, you can use it to turn on or off anything you'd like, such as a whole-house speaker audio feed from your ham shack! Just use miniature SPDT and DPDT toggle switches, capable of handling the voltage and current of the circuit that you wish to control, and wired as shown in **Fig. 2(c)**. Of course, if you're controlling a 120 volt AC circuit, use only UL-approved three-way and four-way electrical power switches and wiring specifically manufactured for that purpose."

Why are they called three-way switches when they are installed in two different locations? Only Edison knows for sure, but the best answer is that "three-way" refers to three different modes of operation. In **Fig. 2(a)**, the lamp can be turned on and off from SW-1, on and off from SW-2, or on from one switch and off from the other—three distinct ways that the circuit can operate.

Pot luck!

From Herb Foster AD4UA: "The MFJ-418 Pocket Morse Code Tutor is a really handy

little device and truly does fit easily in just about any pocket. The earphone option is particularly nice, sparing innocent bystanders from the pain and misery of the Morse code discipline! Since I use my 418 daily to keep my CW speed up to par, it eventually developed a scratchy volume control, apparently just from plain wear. The obvious fix was to replace the control entirely; it's a 10 k pot with a switch, and is available from MFJ [(601) 323-5869 for credit card orders] for $3.48, including shipping.

"Here are a few tips to make replacing the 418's volume control a bit easier: Be sure to use care when opening the case, since there's a flat ribbon cable that connects the board to the LCD display. Try to disturb this cable as little as possible. The old pot comes out easily by using a pair of miniature side-cutters to cut the five connecting straps that connect the pot to the board. Then, a fast touch with a fine-tip iron will remove the stubs of these straps. Save the knob, as the replacement pot/switch doesn't come with one. After you've soldered the connecting straps to the new pot, just drop it in, solder down the five connections to the board, and install the old knob (it takes a micro-tipped Phillips screwdriver).

"When the nine-volt battery gets weak, you'll notice the LCD display blinking in time with the transmitted code. This is a good indication that it's time for a new battery.

"I feel that MFJ may have slipped on one small point in the design of the 418. If you like to be able to observe the LCD display as you use the Morse Tutor in your CW practice, the natural tendency is to lay it down on a desktop with the LCD display facing upward. Unfortunately, this also puts the speaker facing downward toward the desktop, and the sound becomes muffled.

"The fix to this is to buy a package of rubber bumper feet, available widely from hardware stores and supermarkets, and cut out small pieces about three-eighths of an inch square. Put these at the four corners (on the underside), where the speaker grill is located. Two of them will end up on the corners of the battery cover. Now you should be able to put your 418 on a desktop with the display upward, and hear the code audio loud and clear!

"By the way, use the MFJ-418 in the practice QSO mode, and after a few exchanges, the calling station will say that he must QRT for a variety of reasons—the most imaginative one being to change the baby! These *are* the '90s, aren't they?"

Murphy's Corollary: A "fail-safe" circuit will usually destroy the circuit it's protecting!

As always, our thanks go out to those who've contributed their ideas to this month's column, including:

Stephen Reynolds NØPOU
510 S. 130th St.
Omaha NE 68154

Jim Kocsis WA9PYH
53180 Flicker Ln.
South Bend IN 46637

Herbert L. Foster AD4UA
3020 Pennsylvania St.
Melbourne FL 32904-9063

If you're missing any past columns, you can probably find them at *73*'s "Ham To Ham" column home page (with special thanks to Mark Bohnhoff WB9UOM), on the World Wide Web, at: [http://www.rrsta.com/hth].

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Please send any ideas that you would like to see included in this column to the address at top. We will make every attempt to respond to all legitimate ideas in a timely manner, but please send any specific questions, on any particular tip, to the originator of the idea, not to this column's moderator nor to *73 Magazine*. 73

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083

If you're waiting expectantly for the launch of Phase 3D, don't. Once a launch opportunity is announced, it will still be a while before the actual event. But, with the addition of two new digital satellites, *TMSAT-OSCAR-31* and *Gurwin-OSCAR-32* (*Techsat-1B*), and more hamsats on the way, there are plenty of exciting opportunities coming soon.

TMSAT-1 (*T-O-31*) from Thailand and the University of Surrey should be ready for general use by the time you read this. Although there is some concern about the transmitter output level on 436.923 MHz dropping from 1.8 W to 0.9 W, the other onboard systems are working very well. Many excellent pictures have been taken by the satellite and can be downloaded directly from the satellite or viewed via the Internet on the AMSAT Web page at [http://www.amsat.org]. Just look for the links to TMSAT. The direct URL (Universal Resource Locator) to TMSAT is: [http://www.ee.surrey.ac.uk/EE/CSER/UOSAT/amateur/tmsat/].

Although *T-O-31* is capable of running 9600 baud, it is expected that 38.4 kbps (kilobits per second) will become a standard downlink speed due to the large size (3.3 Mb) of the Earth-imaging pictures the satellite is producing. The compressed images available via the Internet are over 500 K each, JPEG format, so there is some minor image quality loss. For the multi-spectral images, data from the Narrow Angle Camera, sensing in the green, red, and near-IR spectra, is processed to create an image 1020 x 1020 pixels, covering an area of 100 x 100 km at a mean ground resolution of 98 meters/pixel. The *T-O-31* picture of San Francisco shows excellent detail with many easily recognizable areas.

Information has been a bit slow about activities surrounding the new Israeli hamsat *Gurwin-OSCAR-32*. The primary downlink has been on 435.225 MHz (9600 baud), but the satellite can also transmit on 435.325 MHz. During the testing phase, a three-second burst of data could be heard once every 30 seconds, but while the satellite is in normal operation, signals can be continuous, especially during picture downloads. *G-O-32* has already taken several pictures from space. Like the ones taken by *T-O-31*, the Techsat images can be found on the Internet. To find out the latest information and look for Earth-imaging pictures, check the URL: [http://techsat.internet-zahev.net/].

New signals from space

There's more on the way! The *SEDSAT-1* satellite project has been moving slowly forward for nearly a decade, and launch is imminent. Another exciting

Photo A. TMSAT-OSCAR-31 *took this shot of the San Francisco Bay area.*

program is ARISS (Amateur Radio on the International Space Station).

SEDSAT-1

SEDS stands for Small Expendable Deployer System. A 20-km tether is used to deploy a small satellite out to a higher orbit from a larger mass while both are connected together via a cord or tether. The satellite, *SEDSAT-1*, has three basic payloads, including SEASIS (SEDS, Earth, Atmosphere and Space Imaging System), TAS (Three-Axis Acceleration Measurement System), and the ham-radio payload.

SEASIS will provide some scientific experiments and allow for unique pictures from space. The CCD-camera systems use a telephoto lens and also a PAL (Panoramic Angular Lens) that will provide 360-degree pictures.

The TAS unit is part of the data collection system to study the dynamics of a mass (the satellite) deployed with a tether. After the initial tether experiments are complete, the amateur-radio payload will be available for use.

The ham radio, analog Mode-A transponder has an uplink passband from 145.915 to 145.975 MHz coupled to a downlink from 29.350 to 29.410 MHz. It's the first American-made, Mode-A linear transponder in many years.

The digital communications system uses a 1268.213 MHz uplink with a 70-cm downlink on 437.907 MHz. It is capable of 9600 baud like the current high-speed digital satellites. Other experimental digital modes and higher speeds can be supported. Check the SEDSAT Web page at [http://www. seds.org/sedsat/] and the AMSAT Web page at: [http://www.amsat.org].

ARISS

Manned-space ham activities will experience a quantum leap with the full implementation of ARISS, or Amateur Radio on the International Space Station. While the advances of voice and packet operations on *MIR* have proved to be incredibly valuable for educational and recreational activities, they will be viewed as only a step on the path to a rather significant, full-featured ham station in orbit, in just a few years.

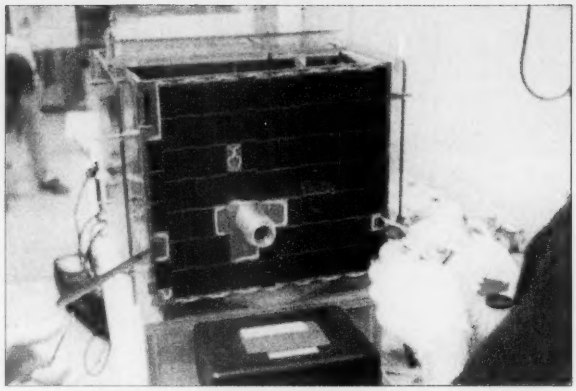

Photo C. SEDSAT-1 *is under construction in Huntsville, Alabama.*

While a very simple amateur-radio payload was proposed for Owen Garriott's *Skylab* mission in 1973, it would be 10 years later when Owen finally got to operate from space. NASA did not approve the *Skylab* ham station due to time constraints and other factors, but SAREX, the Shuttle Amateur Radio Experiment, was delivered to orbit with *STS-9* on November 28, 1983. The small Motorola two-meter HT and window-mounted antenna systems have done extremely well for over a decade and have been enhanced with SSTV (Slow-Scan Television), packet, and FSTV (Fast-Scan Television) gear. As NASA Principal Investigator until his retirement just a few years ago, Lou McFadin W5DID supported the effort from its inception. Since then, Matt Bordelon KC5BTL has taken over to provide continuity for the program.

AMSAT Vice President of Manned Space Activities Frank Bauer KA3HDO is the designer

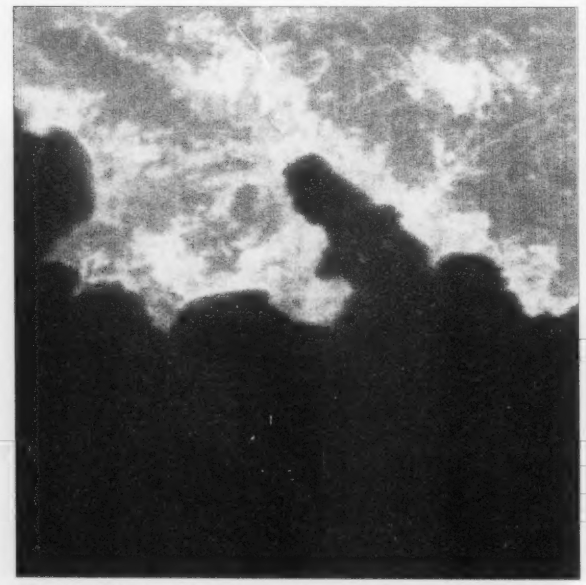

Photo B. *This view of Earth was taken from* Gurwin-OSCAR-32.

Photo D. *ARISS Coordinator and AMSAT VP Manned Space Activities Frank Bauer KA3HDO shows off the inside of an ISS module mockup.*

Number 47 on your Feedback card

On the Go

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4
1011 Peacock Ave. NE
Palm Bay FL 32907-1371
[ke8yn@juno.com]

Up, up, and away

Part of the fun of operating mobile or portable is the actual operation, while an equal part is the location or conditions under which you operate. Not every mobile operation is in a car, and some vehicles are more challenging than others. Although we are licensed to operate our transmitting equipment, sometimes that alone is not sufficient to permit the operation of a transmitter. In some operating positions there are others who can dictate as to whether or not a station may be operated. Two classic cases are on board a boat or ship and aboard an aircraft. Both situations are similar because the master of the vessel, whether a ship's captain or the pilot in command of an aircraft, must give permission before someone may operate a station on board.

Operating aeronautical mobile can be a lot of fun, but a number of factors must be considered. First, it cannot be done on a commercial scheduled flight, since all airlines not only prohibit the operation of transmitters by passengers, but also the operation of radio receivers. This is because there are concerns that electronic equipment may interfere with the aircraft's electronic equipment, which provides both communications and navigation support. Virtually all commercial flights are operated in controlled airspace under instrument flight rules which require frequent communication with air traffic control. Transmissions which occur within the skin of the aircraft may create interference to the navigation equipment. There are even concerns that receivers can cause interference because of the intermediate frequencies which they produce. Given some of the interference we hams have seen with consumer electronics, this is not an idle concern. How many times have you heard of RFI problems with electric organs, inexpensive telephones, or even doorbells?

On some aircraft, radio operation may be possible. "Aircraft" may mean a hot air balloon, a glider or sailplane, a blimp, or a private plane. While radio operation may be possible on a helicopter, most helicopters produce enough noise to make it impractical.

Of all of the options, the one you may have the greatest opportunity to try is on a private plane. Once again, remember this is subject to the approval of the pilot in command. Courtesy and curiosity should dictate being aware of the pilot's radio equipment before considering the addition of amateur communications. Navigation is generally between 108 and 118 MHz. Communications among aircraft or between aircraft and the ground are generally conducted between 118 to 137 MHz. These frequencies use amplitude modulation, which is not as commonly used as either FM or single sideband. I've read various articles which state that this is because there is too much old equipment to convert to FM, but there is also another explanation which may be more accurate. FM receivers capture the stronger of two signals, whereas AM allows two signals to both be heard to some degree. With AM, if an aircraft were to make an emergency call while another aircraft were transmitting, the emergency call could be heard. Some aircraft may have other navigational receivers for nondirectional radio beacons (NDB) or for the global positioning satellite system. Interestingly, aircraft are not required to have radio equipment if not flown in an area which is under air traffic control, although most do have several radios, often backed up by an aviation band handie-talkie.

An aircraft with radio equipment operating in most areas will be in communication with some form of air traffic control. This may be a tower of a center. If no traffic control is available, a common frequency will be used as a unicom or common traffic advisory frequency for a particular airfield. Many aircraft will use a second radio to monitor the emergency frequency of 121.5 MHz, which is used both to request assistance and by emergency locator beacons.

Naturally, operating as an aeronautical mobile amateur radio station will have certain restrictions based on room for a rig and an antenna. While external antennas can be configured from many frequencies, the antenna creates drag on the aircraft, which may affect its performance. A vertical antenna

Continued on page 50

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and chief organizer of ARISS. His three-stage plan to make a permanent place for ham radio on the International Space Station has required many hours of dedicated effort.

The first stage of Frank's plan calls for two-meter and 70-cm FM capability with an external antenna. In addition to voice, an automatic packet BBS (bulletin-board system) would be included. The radios would be intrinsically-safe commercial HTs from Ericsson. They are simple to operate, include screen displays for frequency and other data, and can be easily reprogrammed in orbit via the laptop computers carried on the ISS. The TNC, or Terminal Node Controller, for packet operation is to be a PicoPacket unit from PacComm. It should function in a very similar fashion to the unit currently on *MIR*.

The second stage of the project, in about five years, is to arrange for space on an Express Pallet. This is an externally mounted experiment container that can be loaded with ham gear that can emulate a ham-radio satellite and attached to the ISS. The contents are not brought aboard the station, but are powered from the ISS and can be controlled from the station or from the ground. A repeater or OSCARlike linear transponder system could be built into the container, complete with external antennas.

The third and final currently-planned stage of the ARISS program includes ham gear in permanent rack space in the habitation module of the space station. The proposal has been approved and the gear is in development.

Goals for the system include voice, packet, satellite and ATV (Amateur TeleVision) concurrent operation. Based on the goals, the envisioned hardware would require 24 inches of rack space and would draw 200 watts. Multiple transceivers would be used to cover 10 meters, two meters, 70 cm, 23 cm and higher bands. Power output will be five to 25 watts except on ATV, where 100 watts is more appropriate. External omni antennas would be incorporated except for gain antennas for satellite and high-data-rate digital communications.

The ARISS program is progressing very well with partners from many countries. You can study the details for yourself via the Internet. Start at the URL [http://garc.gsfc.nasa.gov/~ariss/]. 73

Number 48 on your Feedback card

New Products

3 El 6 m Yagi from MFJ

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To request a catalog or for more information about the G4ZPY keys, call Marshall Emm at (303) 752-3382; E-mail him at [info@MorseX.com]; or write to Morse Express, 3140 Peoria St., Unit K-156, Aurora CO 80014-3155.

Better Late than New Year

Svetlana Electron Devices, Inc., of St. Petersburg, Russia, has released its *1998 Audio Tube Catalog*. Svetlana has been manufacturing vacuum tubes since 1928, and is one of the largest international suppliers of audio tubes to OEMs. Svetlana's extensive variety of audio tubes are designed and built with exceptional quality and sonic performance characteristics. Catalogs are built with bureaucratic performance characteristics. Never mind. Get a 1998 one anyway, from Svetlana Electron Devices, Inc., 3000 Alpine Road, Portola Valley CA 94028; check the Web site at [www.svetlana.com].

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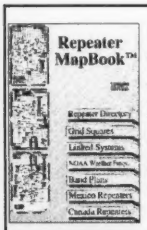

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You may have read or heard comments about the state of amateur radio and how we need to get off our duffs and get back to cutting-edge technology. That is, we need to get beyond the world of rag-chewing on repeaters and SSB. There are commercial outfits out there who are willing to push hams right off the spectrum map so they can purchase, utilize and make bucks using the frequencies we take for granted.

Additionally, these capitalists justify their right to purchase "our air space" by taking the position that ham radio has ceased to contribute to the development of the art of communication and is merely following its lead. If that isn't enough, many local government emergency coordinators are not sold on the value of ham radio in an emergency and choose to rely on their own sophisticated systems.

While pondering these viewpoints, I reviewed a recent letter from Bob W6EUZ concerning his experiences with SSTV. He wrote because he had read of some of my experiences and felt he could help me "get a grip" (my phrase—not Bob's) on reality about HF SSTV in the western states.

Bob was not having the instant success I had promised and expressed some needs for possible organization of 40- and 80-meter SSTV activity out west. The more I thought about this, the more sense it made. Experience had taught that it is difficult at best to work the folks in the east on 14.230 without an amplifier. (At this writing, I am still without the amplifier that smoked during a recent RTTY session.)

As the above two facts chewed on my senses for a few days, it became obvious that something more in-depth than the return letter to Bob was justified. He hadn't left his phone number, so I started tracking it down. This was a little comical. My first attempt was to look in the Internet "white pages" listings.

There was one listing that almost fit Bob's description, and I called hoping it was a relative. No, there are just a lot of listings with the same first and last name. But I had the area code now. Still, it would seem that one of the on-line databases should come through. I was beginning to think he was unlisted.

One more try. Dialed information on the old-fashioned landline and ... Bingo! I had a number. The lesson? Those databases on the Net are not complete. Enough of that. I could have saved 45 minutes, but you know the male ego when it comes to stopping to ask for directions.

Bob had some interesting input. He, like most of us, attempts to be a frugal ham. SSTV *can* be done on a budget, as I have demonstrated, but things go wrong. He told me of a nifty new unit by Kenwood that I had not heard about. I looked up a description of it. It appears to be a digital camera that not only interfaces to the computer but also to Kenwood radios. It is model VC-H1.

That sounds very innovative and should be an ideal setup. He says it works great interfaced to his Kenwood HT for VHF as well as to his Kenwood HF rig, but that the company is still working out the details (cables) to work with other rigs. I found the scant details listed on the Kenwood Web site, but Bob's info filled in the chinks. The little camera should be a great addition to anyone's array of Kenwood gear and other lines as cables are made available.

Bob and I arranged to meet on 40 meters the next day to see what conditions were like. They sounded good, so we made an attempt on the next weekday morning to try a little SSTV operation. It looked good at about 7.165 and I sent him an image which was recognizable on his screen—far from first rate but, nevertheless, a workable image.

This was without the help of an amplifier or any fancy antenna at either end. What was surprising to me was that there was something close to that frequency that was cutting up Bob's SSB signal badly, yet the audio carrying the image still worked. At least we came away assured that low power was not

Continued on page 51

On The Go

continued from page 47

will be limited to VHF or UHF frequencies, while an HF antenna would create a greater challenge. It is possible to run a wire from the tail of the plane to the fuselage, or to trail a wire, but these are not practical for most applications. Fortunately, a handie-talkie with a rubber duck can produce some interesting results, so we'll stick to UHF or VHF frequencies.

VHF transmissions are limited to line of sight, which is one of the reasons that effective radiated power (ERP) is a function of output power and the height of the antenna. A few milliwatts can be quite effective at 7500 feet above ground level. This is one of the reasons that it is considered very bad form to ever use a repeater from an aeronautical mobile unless it is an emergency. An HT in an airplane can bring up every repeater on a given frequency for hundreds of miles, which is not appreciated by the other users of those repeaters. Incidentally, this is another reason that cellular telephones are not permitted to be used on aircraft. Since each cellular phone is low power, the expectation is that it will reach only a few cell towers and the computer can pick the strongest signal; from an aircraft the cellular telephone would simultaneously affect many cells over a wide area, creating problems for the network.

Simplex frequencies are the way to go for aeronautical mobile operations, although a few more caveats are in order. First, never forget that the pilot is in full command. If things get busy in the cockpit and he or she tells you to cease transmission, you must comply. Second, remember that some simplex frequencies have designated purposes. The standard two-meter calling frequency of 146.52 is also used as the wilderness protocol frequency, with priority the first five minutes past the hour from 7:00 a.m. until 10:05 p.m. This is why it may be interesting to take an HT along on a private plane even if you do not expect to transmit. If the pilot in command allows you to at least monitor, you may be surprised by what you hear from that altitude. Besides, one more working radio is good insurance in any cockpit.

What's the most interesting place you operated a station, either mobile or portable? What's the most interesting thing that has happened to you when operating? What would you like to do, do again, or do different? Let me know, either by E-mail or snail-mail to the address at the top of the column. I hear a lot of mobile and portable stations out there. Why not share your experience? 73

a hindrance to working slow scan on 40 meters.

What is needed is a clear frequency at the right time of day. In the eastern part of the country, the recommended frequency is 7.171. However, neither of us had heard a 40-meter slow scan signal from this end of the country and there is an apparent broadcast signal close by.

We decided to meet as often as we could in the early part of the afternoon at 7.190, as that sounded like it had the least interference. Bob was in a transition between rigs and I had to be out of town, so it was a week or so before we got our schedule together.

Incidentally, there is SSTV activity on 3.785. I ran across it one evening. An attempt to copy failed due to the splatter from an adjacent (about 3 kHz away) ham engaged in ensuring he could be heard in the next county. Been that way ever since I can recall on 75 meters. There must be some simple justification for the California Kilowatt, but I have never heard it.

What does this mean for 40-meter SSTV in the west? If you are like many of us who feel it shouldn't take a megabuck/-watt station to play with SSTV, listen around 7.190 at approximately 1 to 1:30 p.m. Pacific time. If you come by when there is no activity, give a call. There may be someone just like you listening for an organized net. A net it is not. It is just a place to meet to try out some of this fun stuff and exchange ideas.

As I was talking to Bob, several ideas came to mind. The first was establishing a place and time to play. Another was the fact that most folks who would like to get involved don't know where to start and soon discover a lot of the advice falls short or just plain misses the mark.

Don't let it get confusing

Many of today's digital modes require a relatively small investment, especially when compared with a few years back when the approach was expensive hardware. Computers have made a huge difference.

To get started in SSTV, I tell people that with a good computer they can get their feet wet for under $50. One method includes using free software (EZ SSTV from Pasokon) and building a serial modem as described on the Pasokon Web site (see **Table 1**) plus cables. If you approach it this way, you will have a lot of fun watching something work that you have built from scratch. This is DOS programming and it works. If you like what you see, they have upgrades for extra bucks and you can enjoy truly great performance.

There is another way that is even more painless in the pocketbook for a budget introduction to SSTV. This one uses the soundboard in your PC, with no modem to build, and no hardware except a few cables. Connect your transceiver to your PC, and you are in business. The initial outlay? The cost of the cables. I used some old audio cable with a few new plugs and got the system working for under $10! Check out ChromaPIX in **Table 1**.

There is a slight catch, but it is not really annoying. This is shareware—a lot of work went into it, and the authors deserve to be paid if the program works for you. The program is not crippled and you can use it forever without registering, but it will only run for 30 minutes at a time until you pay your dues. You will find that is enough time, if you plan your sessions wisely, to get a good feel for this excellent program and decide if it is for you.

Help for your soundcard SSTV operation

One of the problems when using a soundcard for digital communications is that there is no way for the soundcard to automatically operate the push-to-talk (PTT) on the transceiver. When I first tested the ChromaPIX program I found that the method to initiate the transmission of an image was to manually place my rig in transmit

Continued on page 56

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom – German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio—where packet started—new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
VHF packet serial modem kit	http://www.ldgelectronics.com

Table 1. *Current Web addresses. All of the above were cut and pasted directly from the Web page to avoid the inevitable errors when copying. If you encounter a problem with a European address, the network is often at fault. Try again later.*

Number 52 on your Feedback card

The Drake TR Series: No Introduction Needed

... but here's the skinny on some of the best vintage equipment available today.

Bill Clarke W2BLC
764 Altamont-Voorheesville Road
Altamont NY 12009
[BillClarke@bigfoot.com]

In the early 1960s, the R.L. Drake Company introduced a very successful line of SSB ham equipment. As a result, Drake equipment became known for its high quality and high dollar value. Today, Drake equipment is again becoming popular, as vintage equipment—representing an era of ham radio's past.

Capability-wise, the Drake TR series of HF transceivers offers good stability, has excellent receivers with great selectivity, and can do better than 200 watts output. Another real positive feature is that they are supported by a company that is still in business.

The TR-3

The Drake TR-3, introduced in 1963, was Drake's first HF transceiver.

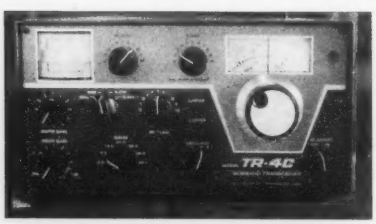

Photo A. *The face plate, with dials in darned good shape, of the TR-4C. Photos by Joel Thurtell K8PSV.*

It was to become the basis for the TR-4 series that followed.

The TR-3 used three tubes in the final RF amplifier, as do all the TR series transceivers, unlike its contemporaries from Collins, Hallicrafters, and National.

The chassis of the TR-3 is copper-plated, although most units you will see today have some rust showing through. The front panel is labeled by reverse engraving (brushed metal that is slightly higher than the painted background). There is very little in the TR-3 that is solid state.

A new TR-3 sold for $550. Accessories were priced at: AC supply $79.95, MS-3 speaker $19.95, RV-3 remote VFO $79.95. In 1998 dollars the entire station would have cost about $3500.

Specifications for the TR-3

GENERAL
- Frequency coverage: 10–80 meters in seven 600 kHz ranges
- Modes: LSB, USB, CW, and AM
- Built-in sidetone
- Automatic T/R switching on CW
- 30 tubes and semiconductors
- VFO with 1 kHz dial divisions (on the VFO knob skirt)
- Dimensions: 5-1/2 inches high, 10-3/4 inches wide, 14-3/8 inches deep
- Weight: 16 lbs.

TRANSMIT
- Input power: SSB 300 watts PEP
- AM 260 watts PEP controlled carrier
- CW 260 watts
- Adjustable pi-network
- VOX or PTT

RECEIVE
- Sensitivity: >1/2 µV for 10 dB S/N
- IF selectivity: 2.1 kHz @ 6 dB
- 3.6 kHz @ 60 dB
- AGC (fast attack, slow release in high noise)
- RF gain control
- Noise blanker
- Diode detector for AM reception

ACCESSORIES
- MS-3 Matching speaker
- RV-3 Remote VFO (XMIT/RX or split operation)
- AC-3 Power supply (120 VAC)
- DC-3 Power supply (12 VDC)

The TR-4 series

Progressing from the TR-3 into the TR-4 series, the early TR-4 transceivers had a TR-3-style main tuning knob (kHz markings on the VFO knob

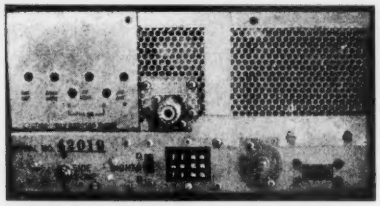

***Photo B.** Rear view.*

skirt). The 9 MHz sideband filters used in early TR-4s are four poles and are enclosed in sealed boxes. The tubular capacitors used in the radio are white in color and were manufactured by CD. No noise blanker control is on the front panel and there are no provisions for its installation (no receptacle) on the chassis.

Late TR-4 transceivers have the TR-4C style main tuning knob (1 kHz divisions on the dial), a VFO "in use" indicator (used in conjunction with a remote VFO), and some front panel markings different in color from the early units. The 9 MHz filters have eight poles. Internally, the tubular capacitors are yellow in color and manufactured by CDE. There is a noise blanker control on the front panel and provisions for its installation on the chassis.

As with the TR-3, the TR-4 series chassis was copper-plated until the TR-4C came along. After that time, it was no longer plated.

The TR4CW/RIT was the final model in the Drake TR series. Appearance-wise, it has the RIT control positioned in the lower right-hand corner where the noise blanker control was on earlier models. Two push switches on the lower front of the panel turn the RIT and noise blanker functions on/off.

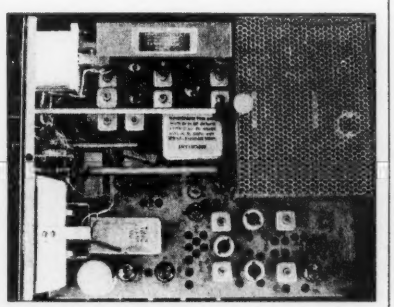

***Photo C.** The top view of the interior. Note the noise blanker.*

By the time the series had worked its way through to the TR-4CW/RIT, the following features had been added:

- CW sidetone
- Optional noise blanker
- Receiver incremental tuning (RIT)
- Selectable 500 Hz CW filter
- Redesigned dial showing 1 kHz calibration points
- Redesigned main tuning knob
- Relative RF power output monitor
- Changed final tubes from 12JB6s to 6JB6s
- Solid state PTO (permeability-tuned oscillator)
- Fully silk-screened front panel

Overall, the TR-3 and TR-4 series of transceivers saw few major changes externally and only what amounted to upgrades internally. Also, some bells and whistles were added along the way, such as the noise blanker, optional filters, and RIT.

Drake made a 15-year run of this series before moving on to fully solid state equipment, and then slipping into obscurity in the ham radio field.

Specifications for the TR-4 ($599.95 in 1965, less power supply)

GENERAL

- All amateur bands 10–80 meters in seven 600 kHz ranges
- Solid state VFO with 1 kHz dial divisions
- Modes: LSB, USB, CW, and AM
- Built-in sidetone and automatic T/R switching on CW
- 30 tubes and semiconductors
- Solid state VFO with 1 kHz dial divisions (on the VFO knob skirt)
- Dimensions: 5-1/2 inches high, 10-3/4 inches wide, 14-3/8 inches deep
- Weight: 16 lbs.

TRANSMIT

- VOX or PTT on SSB or AM
- Input power: SSB 300 watts PEP
- AM 260 watts PEP controlled carrier
- CW 260 watts
- Adjustable pi-network

RECEIVE

- Sensitivity: >1/2 µV for 10 dB S/N

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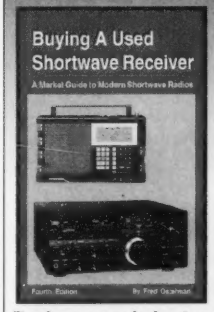

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•3.6 kHz @ 60 dB
•AGC full on receive modes
•Variable with RF gain control
•Fast attack, slow release with noise pulse suppression
•Diode detector for AM reception

ACCESSORIES
•MMK-3 Mobile mounting kit
•MS-4 Matching speaker
•AC-4, DC-4 Power supplies
•RV-4 Remote VFO (includes five-inch speaker) and space for AC supply
•34-NB Noise blanker

The TR-4C sold for $599.99 in 1972 (less power supply). Here's how it compared:

GENERAL
•All amateur bands 10–80 meters in seven 600 kHz ranges
•500 MHz CW filter on CW models
•Solid state VFO with 1 kHz dial divisions
•RIT (receive incremental tuning) on CW/RIT model
•Modes: LSB, USB, CW, and AM
•Built-in sidetone and automatic T/R switching on CW
•30 tubes and semiconductors
•Dimensions: 5-1/2 inches high, 10-3/4 inches wide, 14-3/8 inches deep
•Weight: 16 lbs.

TRANSMIT
•VOX or PTT on SSB or AM
•Input power: SSB 300 watts PEP
•AM 260 watts PEP controlled carrier
•CW 260 watts
•Adjustable pi-network

RECEIVE
•Sensitivity: >1/2 µV for 10 dB S/N
•IF selectivity: 2.1 kHz @ 6 dB
•3.6 kHz @ 60 dB
•AGC full on receive modes
•Variable with RF gain control
•Fast attack, slow release with noise pulse suppression
•Diode detector for AM reception

ACCESSORIES
•MMK-3 Mobile mounting kit
•MS-4 Matching speaker
•RV-4C Remote VFO
•AC-4, DC-4 Power supplies
•FF-1 Fixed frequency adapter (two fixed channels)
•34-PNB Noise blanker

Getting older

Interested in getting a vintage Drake rig? When purchasing, owning, or using any older ham gear, take note: Age will take its toll. Below is a list of several common age-related problems associated with Drake equipment:

MECHANICAL
•PTO end play needs adjustment
•PTO lubricant dried out
•Vernier drives wear, dry out, and become stiff
•Switch and control shafts dry out and become stiff
•Switch contacts wear out, corrode, or get dirty
•Dirt, dust, and rust on chassis

ELECTRONIC
•Electrolytics dry out (particularly in power supplies)
•Small parts such as resistors and ceramic caps fry
•AC line cords need replacing
•Tubes become weak with use
•Alignment is required annually
•Unknown and undocumented modifications by past owners

APPEARANCE
•Blemishes on case/face plate
•Lost or incorrect screws
•Control knobs missing, damaged, or discolored
•Front panel spacers missing
•Dial plates scraped or discolored
•Clear plastics are scratched
•Blue filters wash out

Maintenance hints

This recommendation is not just for Drake owners, or even vintage equipment owners; it applies to all of us. Start and maintain a logbook for each major piece of equipment you own (transmitters, receivers, transceivers, amplifiers, computers, etc.). A single logbook will suffice for all the small stuff, such as tuners, filters, scopes, switching systems, and anten-

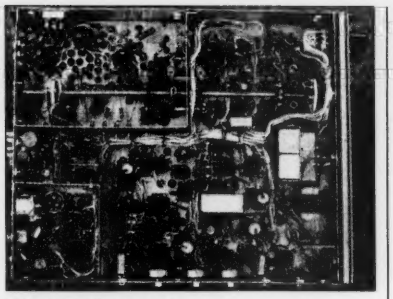

***Photo D.** Bottom view.*

nas. Don't use a segmented logbook, as you will one day have to remove some of it (when you sell or trade a piece of equipment). A loose-leaf binder with dividers, however, would be quite appropriate.

In these logbooks, enter information about the equipment, including its history, source, past owners, price, serial numbers (for insurance purposes), date of purchase, when it was placed into service, and other comments. Every time you perform maintenance, do an alignment, make a modification, etc., make a logbook entry describing what work was done. These entries can prove invaluable as time passes—and you forget what you have done to the rig. Reverse engineering of past mods is not fun.

A complete logbook will also help a new owner in understanding the equipment and anything unusual about it (such as old modifications).

Owning a vintage Drake

A vintage piece of Drake equipment is a piece of history. It is also a rugged unit designed to be used and enjoyed. Do just that! Get it on the air and have a ball. Of course, seeing that the rig is probably 20 to 30 years old, a little care should be taken. No doubt some servicing will be necessary before you place the rig on the air, unless you got really lucky and found a top-notch one. However, at sometime in the future you will be servicing it.

Service your Drake

First and foremost—get a manual for the rig (original or copy). An "owner's" manual will normally suffice, as back when these rigs were built, most hams serviced and aligned their own equipment—hence instructions for this work were a part of the manual.

These Drake transceivers, like other equipment of the time, did not use PLLs, digital systems, electronic switching, or logic circuits. Everything was analog—very straightforward and easy to understand from a schematic diagram.

With some good common sense, the ability to read schematic diagrams and understand circuitry, and armed with a minimum of equipment and tools, most hams should be capable of maintaining this equipment.

WARNING: Unlike modern solid state ham equipment using 12 VDC, tube equipment uses voltages that can be considered lethal. Know what you are doing BEFORE you venture inside these rigs.

Hints to help

Controls (potentiometers) that sound noisy (cause crackling to be heard) should be cleaned chemically. If this does not correct the problem, the offending control will require replacement.

Switch contacts can become intermittent or nonconductive. Use chemical cleaners to correct the problem or replace the switch, switch wafer, or individual contact.

Lubrication can be made easier by using a medical-type hypodermic syringe to inject lubricant into hard to reach and tight areas.

Only use plastic or nylon tools for alignment work. They will not damage the fragile slugs.

Over the years I have found it better to replace relays than to repair them. Chemical cleaning may help; however, burnishing them is only very temporary in effect, with failure assured to happen again.

Pull each tube from its socket, check the socket, clean it and the tube's pins chemically, and reinsert the tube.

WARNING: Chemical cleaners are not friendly to the user or to the environment. Use only according to directions.

A prime cause of intermittent problems is terminal strips which are attached to the chassis with a single screw, nut and bolt, or rivet. It is a good idea to go over the entire rig and

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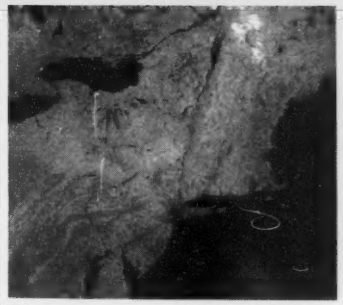

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tighten each terminal strip. If rivets are encountered, you can drill them out and replace them with nuts and bolts, when necessary.

Cases and hardware can be cleaned using automotive materials such as waxes and buffers. Front panels are another story. If there is significant damage or wear to the front panel, you may have to hire the work out. In many cases it is nearly impossible for an individual to do the work and get it to look like new.

Use hint

With all those vacuum tubes (glowbugs) packed into a relatively small cabinet, Drake transceivers make great heaters—and they get even warmer when transmitting.

I recommend you use a muffin fan over the final tubes to provide cooling. In the past, I have put rubber feet on the muffin fans and just set them on the top cover. This works and doesn't call for drilling or cutting holes in anything.

Drake company

Drake still offers factory support for their equipment, even though some rigs are over 30 years old. For more information, contact the R.L. Drake Company at (513) 746-6990, by FAX at (513) 743-4576 or by E-mail (service related only) at [bill_frost@rldrake.com]. The Drake list home page at [www.min.net/%7Ethom/drakelist/index.html] is the single best source of Drake information that I have found on the Internet. The Web page is maintained by Thom LaCosta K3HRN. Be sure to visit the section about modifications to the various Drake rigs by Wayne Montague VE3EFJ; it is very complete and extremely interesting (you could and should spend hours reading this). Thom also maintains the Drake Mailing List, which you can learn more about by sending an E-mail to [drakelist-request@baltimoremd.com] with a subject of [help]. The listserver will return a message to you with further instructions.

A special thanks to Joel Thurtell K8PSV for the photos used in this article. Joel is a specialty radio dealer and operates The Radio Finder, a Web site for the buying, trading, and selling of tube-type amateur and military radio equipment. The address of The Radio Finder is [www.radiofinder.com] or you may contact him at 11803 Priscilla, Plymouth MI 48170. 73

Seeing Dits & Dahs

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(from any starting point) most often resulted in a series of Ts and Es being displayed for 30 seconds or so, and sometimes required a "hard reset" by turning the unit off and then on again. Often it seemed that the decoder could correctly interpret characters, but could not quite figure out the breaks between words.

The decoder requires a very steady signal, so using it to receive off the air is difficult unless you are trying to copy a W1AW bulletin or something similar, consisting of perfect code with a strong signal.

But the Velleman Morse Decoder is very good at one application, and that is in evaluating hand-sent code. Since I had a straight key hooked up to my keyer, it was simply a matter of switching over to the key to determine whether I can send, by hand, Morse code that a machine can read. The answer was ... yes, with a bit of practice! I thought my fist was better than that, but it didn't take long to coordinate sending and reading so that I could adjust my sending to what must be darned near perfect spacing and speed consistency.

As a training aid for sending, the decoder has considerable potential and could be worth the $89.95 price tag.

Sources:

Velleman Components N.V.
Legen Heirweg 33, B-9890 Gavere, Belgium
+32 (0) 9 384.36.11
[www.velleman.be]

TechAmerica
P.O. Box 1981
Ft. Worth TX 76101-1981
(800) 613-7080
[www.techam.com] 73

The Digital Port

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mode, then tell the program to transmit the image.

That works perfectly well, but now you will find two circuits detailed on the ChromaPIX Web site that facilitate simultaneous automatic keying of the transceiver and transmittal of the image.

I opted to build the simpler circuit, as pictured in **Photo A,** to bring one-handed push-button operation into the shack.

So ... what are we going to do to attract youth to the ham ranks? What do kids do today that is similar to what we thought was cutting-edge when TV was black and white? (Oops, revealed my age.) All right—let's look at when I was a kid for a minute. I had put together a shortwave radio from a kit (Knight, I think—probably about $20 worth) and listened to the most fascinating signals imaginable. Ordinary people were talking to each other from all over the country and sometimes from other countries. They were having fun and I wanted to be a part of it.

Today's youth are caught up in the Internet, satellite TV, handheld games, cell phones, pagers and so many gadgets and toys that were nearly inconceivable just a few years back except for readers of "Buck Rogers" comic strips. That is quite a load of technology to compete with, and I doubt it can be done by making ham repeater access available to the masses. If that is all ham radio has to offer, we lose—big time.

Ask yourself: What holds my interest in ham radio? Why am I reading this magazine? You know the answers. There are still frontiers to explore via ham radio that simply are not available by purchasing a few toys at the local electronics discount emporium and plugging them in.

Those toys are good and useful, but they don't make the user different. He cannot express himself any differently than everyone else who made the same purchase. He can't modify and improve. There are no contests

NEVER SAY DIE

continued from page 5

student is, your best bet for learning is reading books. The trick is to find books that are both easy to read and reliable. I've made a stab at this with my *Secret Guide to Wisdom* review of around a hundred outstanding books. But I keep asking my readers and listeners to keep their minds peeled for outstanding books. And I've been keeping Barnes & Noble busy trying to get them for me.

Improving Your Memory

You can retain virtually everything you've read if you take a little time to refresh your memory. This is a secret technique that I've never seen mentioned by anyone, and it *is* simple.

This is best done with the help of someone else. Someone with patience. They're going to sit down with you and help you refresh your memory. What you do, just after you've finished reading a book, is to sit or lie down and get comfortable. Close your eyes and go through the book, from beginning to end in your mind, remembering every detail you can. Your helper will stop you every now and then, asking you where you are and what you are remembering. Then you'll continue scanning the book. When you get to the end, go back and start all over again, remembering every detail from the first scan, and adding other parts that you missed the first time through, as they come to mind. You'll find you can scan the first run through in a fraction of the time, but without skipping anything. When you are stopped you'll be able to say right where you are in the book. By the fourth scan of the book you'll take just seconds to cover every detail of the whole book.

Every couple of months you'll want to refresh your recall of the details, so scan the book again in your mind a couple of times to get back up to speed. In this way you'll be able to keep the details of hundreds of books right fresh in your mind.

Like any muscle or other function of the body, the more you use your mind, the more powerful it will get. They say we're using about 2% of our brains. I suspect that's a serious understatement. It's probably more like 0.1% of its real potential. Alas, laziness being what it is, many (most?) of us tend to avoid thinking as much as possible. And exercising, too. Thus many of us end up doddering, hunchbacked geezers who haven't thought an original thought in years.

Spirit Memories

When we are able to contact departed spirits via psychics, *Ouija*, tape recorders, near-death experiences, etc., we find that the spirits seem to still have all of the memories they had when they were alive. If our memories aren't electrically

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There lies one of the great secrets. Pique a man's curiosity and soon there will be no holding him back. He will move mountains to satisfy his desire to know and do more. You know there are hams working at cutting-edge innovations for communications and we have mentioned them and their wares in this column. Take a look at the Web sites in **Table 1** for some ideas. Look closely at the TAPR Web site. We hams have a lot to offer.

If we take advantage of what is available, use it frequently, invite the young people in our lives to observe what they can do, and give a hint where it is going, we just may convey to the up-and-coming generation that there is something beyond the horizon. If these things could be introduced to school groups and Scouts, the kids just might take the ball and run. If they do, they will become the greatest asset ham radio has. It is up to us to stimulate that appetite.

Apology for missing last month's issue

I had a great project going last month, but it just wouldn't pan out. I had worked several days past deadline time with nothing to show for it and no backup plan. I was quite disturbed and embarrassed by the time I called in to the *73* office to say I wasn't making it for November.

I enjoy the feedback from this column and realize there are faithful readers. If you will accept my apology, I will attempt to not let that happen in the future. And please keep those cards and letters (E-mail responses are very appropriate) coming. You give me a lot of great ideas.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO. 73

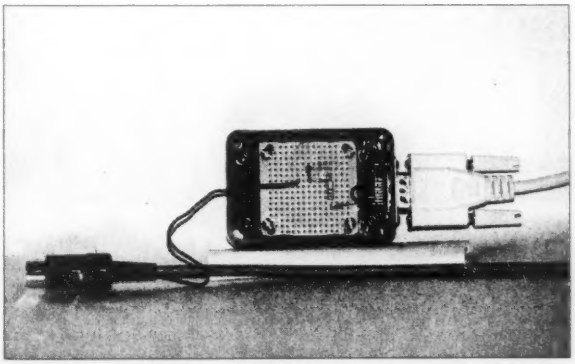

Photo A. *To add to the collection of dedicated cables and little black boxes, this is my version of the PTT circuit when using the soundcard for SSTV. The circuit is available from the ChromaPIX site. The size of the box is overkill for the few components, but it was what I had on hand and keeps it neat. The computer cable connects to the serial port. The audio cable connects the soundcard Lineout to the accessory jack on the back of the ICOM 735.*

or chemically stored in our brains, but in some other medium which we don't yet understand, that could help explain how we can have unlimited memory storage.

This isn't exactly a new idea — I wrote about this at least 30 years ago. But, you know, in spite of the many books I've read on the brain and the mind, I don't recall anyone else proposing such a controversial concept. But that might help explain why people who have lost large parts of the brains in accidents still have all of their memories.

We may be doing well with our electronic technology, but when it comes to consciousness, we're still in the Middle Ages. We know plants can communicate with each other, and with us. We know we can also communicate with any living thing, but we have few clues as to how it works. We know our cells are able to stay in instant communication with us, no matter how far removed. Again, no clue as to how.

There are still powerful barriers preventing research into this area. Barriers of disbelief, kept in place by a refusal to look at the data. Barriers of a lack of funding. After all, even if it's all true, where are the bucks to be made from funding consciousness studies?

Ice Age?

Looking at the temperature data across the northern tier states from Washington to North Dakota, temperatures since 1940 have fallen lower now than they were in 1890, when they had the Little Ice Age. This agrees with the similar decline in temperature since 1940 in every Scandinavia country, also with rising precipitation. This agrees with the declining temperatures reported by satellites and balloon radiosonde data. It also agrees with tree ring data from western and southern US and Europe, with the temperature high around 1940.

The US Dept. of Agriculture Plant Hardiness Zone Map shows a southern deflection of one zone or 10°F between their 1960 and 1990 maps. This strongly affects plants.

In New Hampshire, Vermont and upstate New York we're seeing a migration of moose coming down from Canada, so perhaps Robert Felix is right in his predictions in his book, *Not By Fire, But By Ice*. So much for global warming, eh?

American researchers at the South Pole, who have been keeping accurate records for over 40 years, reported that July 1997 was the coldest month on record.

Yes, I know about the Antarctic ice pack starting to melt and a lump the size of Connecticut calving off. So what's really going on here? Come on, fellas, you can't have it both ways. Are we going to need heavier parkas or more bathing suits and sun screen?

Child Psychology

It's been a while since I pushed you to subscribe to *The New Yorker*, so I can understand if you missed the great article in the August 17th issue about child behavior. Too bad, for it was an amazing article.

It turns out that child psychologists and behavior experts have had it wrong about the influence that parents have on the development of their children. It seems, on the nurture side, that parents have far less of an impact on their kids' behavior than do their peers. Kids don't want to be like adults, they want to be like other kids. So they dress like the other kids, talk like the other kids, and act like the other kids.

It's pertinent that the kids of recent immigrants almost never retain their parents' accents. And that the children of deaf parents learn how to speak as well as those with normal parents. It also turns out that it doesn't make anywhere near as much difference as supposed if there is one parent or two.

This goes counter to Freud and the teachings of professional psychotherapists, but is in line with the results of recent research aimed at finding correlations between parents and how their children turn out. The *Newsweek* editors apparently read *The New Yorker*, because the September 7th issue had the report as the cover feature.

Serendipity

Do you believe in reincarnation and our having past lives? My first introduction to past lives surprised me. Oh, I'd read a little about 'em, and then there was the famous Bridey Murphy case, but that, I thought, had been explained away. Then one day I was regressing a patient under hypnosis, trying to find the root of a problem that had been making his life miserable. We went back and relived several relevant earlier traumas, removing their impact on his life for him. Then I asked him to go to an earlier event which was connected to his problem and suddenly he was telling me about something which had happened in an earlier life.

I didn't know if it was real or not, so I had him relive the traumatic event just as if it were one from his present life, and he was never bothered by this problem again. Hmm. It didn't make any difference to me whether it was real as long as deconditioning the trauma did the job.

After several more patients had flipped into past lives, and more often, past traumatic deaths, the reality that these weren't just the mind's way of handling a current life painful event, but were some sort of past life memories, I began to help my patients explore and remember more of their past lives. I found that they could recall people, places, and events with a remarkable degree of detail and that these memories could be tied to historical records.

That reality took some getting used to. The ramifications took even more getting used to, and got me to questioning the accepted beliefs in Heaven, Hell, God, Satan, and so on. It got me to reading to see what other people had discovered or thought.

If you don't believe in past lives and reincarnation, it's because you haven't read very much about it. There are several books reviewed in my *Secret Guide to Wisdom* which will help fill in this neglected part of your education.

Sunday school teaches you about heaven, but the "real world" teaches that when you die, that's it, and never mind all that Bible baloney.

I've told this story before, but knowing how short your memory is, I'll repeat it. It has to do with how I discovered a book that I recommend anyone read who wants to know about death. It's a great book for comforting someone with a recent loss.

My mother had always been sensitive to things. Using a *Ouija* board, she found out that her uncle would be returning from France after WWI, and was able to describe his cabin and exactly when he would land and call. One time, when I was in the middle of the most upsetting moment of my life, she called and asked what was wrong. That was the only time she ever did that.

One day, a couple of years after her mother, Netta, had died, mother was washing the dishes and one of the elastic straps holding her stretch pants down suddenly broke. She thought, "Oh, darn! I'm going to have to drive down to Littleton and get a new elastic."

When she finished the dishes she sat down to rest and read a little. But it was kind of cool, so she decided to go out to the barn and see if she could find a shawl in Netta's clothes trunk. She dug down into the trunk and found the shawl. When she shook it out, an elastic strap fell to the floor. "Hmm," she said. "Netta, are you trying to tell me something?"

She went back to the house and sat down again to read. But none of the magazines looked interesting. She suddenly got the notion to go back out to the barn and pick out a book at random from the old books in one of the cow stalls. These were books from her father-in-law's estate which had been moved to the barn and just left there.

She picked out a book with no title showing on the spine and went back to the house to read. The book turned out to be a 1920 book, *Neither Dead Nor Sleeping*, by Mae Sewall, with an introduction by Booth Tarkington. The story it told gave my mother the answer to her question.

Mae Sewall, who was a world famous woman of her time in the woman's rights field, told about how her husband, after he'd died, contacted her to help her find several missing papers she needed. He then went on to set up a communications system and did experiments with his friend on the other side, the pianist Artur Rubenstein. It's a fascinating story and one of the best I've found about communicating with the dead. But it's obviously long out of print.

A few years ago I attended a lecture by Dr. Hal Huggins, the dentist who has been fighting the ADA over the use of amalgam fillings. I read his book, *It's All In Your Head*, and included it in my *Guide to Books*. Huggins had proven that the mercury from our fillings was poisoning us. Then I found Dr. Judd's *Good Teeth, Birth to Death*, which also damned mercury and the illnesses it causes.

The next step was when I was being interviewed by Art Bell on his talk show a couple years ago and I pointed out that good health depends a good deal on our not poisoning our bodies with stuff like mercury. Art got all upset. His dentist had assured him that amalgam fillings were harmless and he believed her. Serendipity stepped in when two dentists called the show, both confirming what I was saying.

More serendipity when a book arrived in the mail from Dr. Lydia Bronte, *The Mercury In Your Mouth*. This, too, immediately was added to my *Guide to Books*. I sent Lydia a copy of my *Guide to Books* and she called to say that someone sure ought to get busy and reprint some of the seriously out of print books I'd reviewed. I agreed, but said I just didn't have the time. Further, if I both recommended a book and sold it, that would be a conflict of interest. She said okay, she'd do it, which book would I recommend to start with. I looked through my *Guide* and decided the Sewall book would be the one which might do the most good for people.

I sent her a copy, she had it set in type, and printed up a short run to see how much interest there might be. When it's finished being bound it'll be $15, plus $3 s/h, from Quicksilver Press, 10 E. 87th, NYC 10128. I guarantee that this is a book that you'll treasure, plus be buying copies for any friends who have suffered a loss.

In the Sewall book, every time Artur Rubenstein needed her to make a major expenditure for his experiment, those on "the other side" arranged in some way for her to get a well-paying lecture tour.

How much of what we think of as serendipity actually has been organized by those on "the other side"? There are a couple of books reviewed in my *Guide to Books* which cite some incredible "coincidences." Things which have no logical explanation.

Reports from "the other side" try to explain to us that time is different there. It isn't linear as we experience it, so they're somehow able to arrange things so they'll happen in our time stream for us. Our past, present and future are just another dimension for them — which puts a different aspect on our birth and death.

When something serendipitous happens, try not to ignore it. Follow it up and take advantage of the serendipity.

The Raw Facts

Here I go, talking about health again. Well, I keep seeing that long list of Silent Key awards in *QST* every month and I'm now convinced that virtually every one of those guys would still be alive and polluting our bands with vacuous nonsense if only I'd managed to get through to them.

This conviction was reinforced by the arrival of a book from two of the authors of *Nature's First Law: The Raw-Food Diet*. Having already been convinced of the power of raw food to cure almost anything by Dr. Bruno Comby and his *Maximize Immunity*, plus the writings of Dr. Henry Beier, this new book just further reinforced my conviction. Plus, the whole concept makes perfect sense. I like it when theories make sense.

What all these experts are saying is that if you change to eating all raw food you're going to get over any illnesses you have. You won't get any new illnesses. And you'll be able to live in excellent health to 120 and even 150 years.

How come? Just think about it. Our bodies were developed millions of years ago when all everyone ate was raw food. It wasn't until we invented cooking that we began to get sick and die early.

Dr. Comby has been rescuing his patients from near death due to cancer, AIDS, and so forth, just by changing their diet to all raw food. The *Nature's Law* guys have a similar string of successes.

This is a tough change to consider. Sure, there's lots of raw food available. But darned few restaurants serve much, so if you go out to eat very often you are going to have a major problem.

Eating bananas, oranges, apples, grapes, melons, grapefruit, cherries, and so on is easy. Raw vegetables are more of a problem. Salads are easy. I've been

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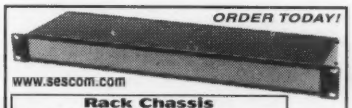
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eating a big bowl of salad for both lunch and dinner for a long time now. Spinach, beet greens, watercress, bean, clover and alfalfa sprouts, with a few raisins make a great salad.

I've found that when I chop up raw broccoli, cauliflower and carrots that the mixture, with a little coleslaw sauce on it, is fine. Raw cabbage with the sauce on it is good, too.

But after have eaten cooked food for a lifetime, it's difficult to just stop. You see, there's this little Chinese restaurant in Hillsboro with a fabulous buffet lunch. Sigh. And a slice of pizza now and then? The ads for the Taco Bell pocket sandwiches looked so inviting on TV, but when we tried a couple one evening, what we got looked nothing like the ads. Ugh. Those big overstuffed TV sandwiches had very little in them when the real world struck. The only thing that was the same was the price.

Instead of a bowl of hot cereal for breakfast, now I'm eating three bananas or three oranges. For lunch a tomato, a big bowl of salad, and a bowl of chopped raw veggies. Dinner is about the same as lunch. But Sherry still wants to go out and eat. There isn't any way to get her to eat raw stuff. Or even fruit or vegetables, for that matter. I'll bet I'll have the same success with you. Sigh. You'd rather die than change your diet. So who wants to live to 150 anyway? My bet is that you'll continue to eat what tastes good and go to the doctor for repairs when your body starts breaking down — turning the responsibility over to him.

When you go raw you'll find that you can eat all you want and your big fat gut will gradually go away, replaced by muscles. You'll automatically get down to your normal body weight. Stuff like asthma, arthritis, diabetes, allergies, and so on will blow away. You'll find your body rebuilding itself, and you'll be full of energy and enthusiasm. Or you can continue your present slide into the obits and a Silent Key listing.

I've been promised an uncook book that'll explain how I can enjoy raw potatoes, beets, onions, and other such vegetables. I've always preferred my cooked veggies *al dente*, so now I'll change to super *al dente*.

If you're game to expose yourself to a powerful polemic — verbal overkill on the subject — invest $15, plus $3 s/h, for a copy of *The Raw Food Diet*, sent to Nature's First Law, Box 900202, San Diego CA 92190, or call 800-205-2350. If you can read this book and not change your diet, you've got more resistance to common sense than I.

Small Biz

New small businesses are thriving in Europe, helping to reduce their serious unemployment situation, and bringing new life to their economies. While the large businesses have been cutting payrolls by 4% a year, these new small businesses have been adding employees at the rate of 16%.

I wish I had the time to organize a lecture tour of Europe, including visits to their heads of state, so I could explain the benefits of setting up my new style of business incubators. I've written about this in my past editorials, and my system is explained in detail in my book *24 Ways to Improve State Government* ($5). This tells how business incubators can be set up in any town which will help fund and guide the growth of new small businesses.

Large businesses are moving their manufacturing to the least expensive countries and replacing much of their middle management with information systems (a.k.a. computers), so we can't look for job growth there for either blue or white collar workers. Worse, large businesses tend to be predatory, looking always for growth by swallowing up smaller businesses, and to have the political clout to get away with almost anything they want.

The health of any country increasingly is dependent on the growth of entrepreneurial businesses — and my incubator system makes their successful startup simple.

Our states and other countries could do worse (and will) than set aside a fund for business incubators to draw on. It would be a profit-making no-lose fund and would result in more jobs and increased business revenues.

Funny Coincidence

A number of scientists have been claiming that nuclear bomb tests, even when underground, can have some long range effects. In mid-May India tested five nukes. A few days later a killer heat wave hit India and Pakistan, killing scores. A few days later the high pressure blockage of winds over India brought massive flooding to China, killing 128.

The next day Pakistan tested five nukes. The day after that 366 died from the most devastating heat wave that had hit India in years. And the day after that an earthquake hit nearby Afghanistan, killing 2,500. The next day another heat wave hit India, killing 100 more.

Four days later the heat waves in India and Pakistan had killed over 1,300 people. The same day tornadoes hit all across the USA, including one in Antrim NH, just a couple miles from where I live.

A week later the India/Pakistan heat death toll was up to 2,500, with still more flooding in China.

In some way the global weather patterns seem to have been affected by the nuclear tests. So much for messing with Mother Nature.

Headstart

The governor of New Hampshire has been pushing hard to have all NH schools start with kindergarten when kids are five years old. She was pushing this agenda when she and I were on the Economic Development Commission Education Subcommittee a few years ago, and she was as impervious to facts then as she is now. Her mind is made up and facts are only a nuisance.

As Thomas Sowell says, "It's amazing how much time and ingenuity people will put into defending some idea that they never bothered to think through at the outset."

Headstart was supposed to give disadvantaged kids a better chance of getting an education. With 2000 agencies and 36,000 classrooms, it's been an expensive experiment. The long-term effects of Headstart have been carefully researched. They found no long-lasting effects on IQ, teen pregnancy, welfare, crime, later economic success, etc. The only people who benefited were the Headstart employees and administrators.

When the National Research Council of the National Academy of Sciences reviewed every post-secondary training program of the last 20 years they found that none of the programs worked. Billions of your money have been wasted.

More Headstart programs? More social spending? I sure hope you'll do your best to stop these wastes of money.

The Swedish, whose students outperform ours by a wide margin, don't start school until they are seven years old.

Nursing Homes

Did you bother to read some of the horror stories in the news media citing recent studies of nursing homes? It makes grim reading, with beating, malnutrition, dehydration and neglect being more the rule than the exception. The nursing home industry is powerful and seems to have control over the state overseers, according to a *Time* magazine Aug. 3rd issue report on California homes. What they found was just awful. Yet, that's where a high percentage of you are headed unless you change your diet.

Indians

The Indians have been doing well by setting up casinos on their reservations. I'm seeing more and more ads on TV by these casinos, so it's obviously a thriving business. Take

the Foxwood Casino in Connecticut. Less than 15 years ago there were only three people living on the reservation. Now they've got gaming revenues of over a billion dollars and the tribe has expanded to 260.

The Indians are complaining that the Europeans came in with higher technology and took their country away. Well, they're right, that's what happened. But the same thing has been happening all through history. The guys with the bigger and better clubs win and take over. The Jews did it when they pushed the Arabs aside and formed Israel. Israel then took the West Bank away from Jordan with their army; they've kept it, and don't seem to be much interested in giving it back.

It was their higher technology that allowed the European countries to take over most of Africa and big lumps of Asia. Through massive mismanagement they've managed to lose most of it. They did the same thing in the Caribbean, with England controlling most of the islands, the French a few, and the Dutch a few. Spain was doing fine until the US shoved 'em out.

All the people who are begging for peace should take a good long look at history and see if they can find any instance where might didn't make right. When you lay your weapons down you are doing it to grab for a yoke to wear. And today, technology is providing us with the bigger club.

Schools

A review of a book by Fred Holden had this quote: "Our system of education teaches just about everything except the three things that matter most — How to make a living, how to live, and how to understand life, especially in areas of economics and politics."

Since, if our schools did teach these basic concepts, our country and our lives might be vastly different, I wonder if the neglect of these subjects is entirely accidental. These are exactly the things I've been writing about, but I should be writing for kids instead of old people whose minds are so closed that the light of reason is unable to penetrate the gloom. Well, I may be exaggerating, but that's the impression I get much of the time.

As far as living successfully and making a good living are concerned, around 90% of the stuff that is "taught" in high school and 100% of college is a waste of time. That was my experience, and things were supposedly a whole lot better those days than now.

Most of what I was taught in science classes has subsequently been proven wrong. Most of the math I suffered through has never been of any real use, and I've been involved with a lot of different businesses. The English literature classes were a huge waste of time. And so it went. Humbug!

Wagging the Dog

It's my fault. I haven't been ragging you lately to subscribe to *The New Yorker* so you wouldn't miss the outstanding articles they manage to come up with. Like the one in the October 12th issue, *The Missiles of August*, subtitled, "The Annals of National Security." It had to do with the missile attack, just three days after Clinton's grand jury testimony about his affair with Monica Lewinsky, on the pharmaceutical factory in Sudan. The attack was claimed to be in retaliation for the truck bombings of the American embassies in Kenya and Tanzania.

The article quoted American businessman Bobby May, who was in Khartoum at the time of the attack. He was very surprised because he and Bishop Brookings (from Nashville) had just visited the factory a few days before and had been shown every part of the operation. The place was a showplace, where kids routinely toured the plant, and not, as the White House spokesman claimed, a heavily guarded chemical factory.

The net result of the use of $60 million of Tomahawk missiles was the destruction of a badly needed pharmaceutical factory in Khartoum, a mess in Afghanistan, no one important killed, and an enormous buildup of resentment through the whole Arab world. Well, it did keep Monica out of the headlines for a few days, so perhaps the White House strategists felt it was worth the expense.

By the way, as you read the article, you'll see that the Joint Chiefs were not consulted before the attack. You'll also probably not be particularly surprised that the intelligence reports which were cited by the White House as an excuse for the attack were of the usual low grade in accuracy.

A propos, I'm enjoying a discounted book ($8) published by Barnes & Noble, *Senseless Secrets*, by Lt. Col. Michael Lanning — subtitled, "The Failures of US Military Intelligence from George Washington to the Present." You no doubt have suspected that, being government agencies, our intelligence departments were probably bungling almost everything they've been doing. What I doubt you've suspected is the extremes that this bungling has often reached. Pester B&N and spend the $8. You're going to be highlighting the hell out of the book and reading sections to anyone who will listen. The author said he'd spent several years as an

Continued on page 64

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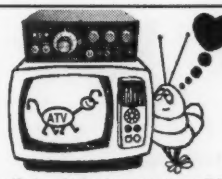

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PROPAGATION

Jim Gray W1XU/7
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Payson AZ 85541
[jimpeg@netzone.com]

December 1998						
SUN	MON	TUE	WED	THU	FRI	SAT
		1 G-F	2 F	3 F-P	4 P	5 P-VP
6 VP	7 P	8 P-F	9 F	10 F-G	11 G-F	12 F-P
13 P-F	14 F	15 F-G	16 G	17 G	18 G-F	19 F
20 F-G	21 G-F	22 F-P	23 P	24 P-VP	25 P	26 P-F
27 F-G	28 G-F	29 F	30 F	31 F-P		

The HF bands in August and September were quite good at times, with DX rolling in on frequencies in the bands between 40 and 10 meters. At one point the solar flux rose to 176—the highest I've seen it since Cycle 22—which is a good sign, but requires a word of caution.

Cycle 23 is likely to provide the lowest peak solar flux value of the last few cycles. One forecaster predicts that the peak will occur in 1999, which I believe is a year or two early, if everything proceeds normally. But nothing about Cycle 23 has been "normal," so it's possible he could be right. We'll just have to wait and see.

Propagation this month is likely to be *irregular* because December is traditionally a month when HF propagation is seasonally low, and we haven't yet seen consistently high solar flux values during this cycle. Therefore, use the calendar to pick the best days (G) for your efforts, but always listen and make a few calls into the void on other days, too, because the universe is full of surprises.

10–12 meters

Possible openings to Europe in the morning, midday openings to Africa and South America, and late afternoon openings to Australasia and the South Pacific. Daytime short-skip openings between 1000 and 2000+ miles are likely as well.

15–17 meters

Worldwide DX possible during daylight hours, peaking toward Europe and the east in early morning, toward the southern hemisphere in the afternoon, and toward the west, South Pacific and Australasia in the late afternoon, with daytime short skip from 1000 to over 2000 miles.

20–30 meters

Openings to Europe and the east during late afternoon hours, with the bands remaining open to various areas of the world during hours of darkness until shortly after sunrise. Daylight short skip to 1000 miles and 2000 miles or so at night.

40 meters

Generally low noise prevails, and openings toward Europe and the east beginning in late afternoon, with the band remaining open all night until after sunrise to various areas of the world. Daytime short skip to about 1000 miles and over 1000 miles at night. This *could* be your best DX band this month!

80 meters

DX to all areas of the world between dark and dawn with signals peaking toward Europe and east around midnight, and to other directions just before dawn. Daytime short skip to 500 miles and nighttime openings to 2000 miles or so.

160 meters

DX possible during early evening and hours of darkness. No daytime short skip, but excellent possibilities at night from 500 to about 1500 miles.

Don't forget to work the *darkness path* (±30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch. 73, W1XU/7. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20					20	20				15
ARGENTINA	20	40	40	40			20	15	15	10	10	15
AUSTRALIA	15	20	20		40	40	40			20	20	15
CANAL ZONE	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40	40		20	15	10	15	20	20	
HAWAII	15	20					20	20	20	10	10	15
INDIA							20	20				
JAPAN	15	20					20	20				15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES							20	20				
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA	20	40					20	10	10	10	15	20
WEST COAST	15/20	20/40	80	160	160	160				10	10	15

CENTRAL UNITED STATES TO:

ALASKA	15							20				15
ARGENTINA	20	20	20	40	40		20	20	15	10	15	15
AUSTRALIA	15	20	20				40				15	10
CANAL ZONE	15	20	40	40	40		20	15	10	10	10	15
ENGLAND	40	40	80					20	15	15	20	40
HAWAII	15	20		40	40	40	40	20	20	15	10	15
INDIA								20				
JAPAN	15							20				15
MEXICO	15	20	40	40	40		20	15	10	10	10	15
PHILIPPINES	15	20						20				15
PUERTO RICO	15	20	40	40	40		20	15	10	10	10	15
RUSSIA (C.I.S.)								20	15	20		
SOUTH AFRICA	20	40						15	10	10	15	20

WESTERN UNITED STATES TO:

ALASKA	10	15	20				40	40	40			20
ARGENTINA	15	20		40	40			20		10	10	15
AUSTRALIA	10	15	20	20			40	40	20	20	15	15
CANAL ZONE	15	20	20					20	15	10	10	10
ENGLAND	20	40	40						15	15	20	20
HAWAII	10	15	20	40	40	40		20	20	15	15	10
INDIA		15	20						20			
JAPAN	10	15	20				40	40	40			20
MEXICO	15	20	20					20	15	10	10	10
PHILIPPINES	10	15/20	15/20			40	40	40		20		20
PUERTO RICO	15	20	20				40	40	40			20
RUSSIA (C.I.S.)									20	20		
SOUTH AFRICA	20	20							15	10	15	15
EAST COAST	15/20	20/40	80	160	160	160				10	10	15

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Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

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Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

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Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months.$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

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Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

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Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

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.....Wayne

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This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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Number 64 on your Feedback card

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at **[www.ohio.net/~rtormet/index.htm]**—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

Orlando HamCation™ and Computer Show Feb. 12–14, Central Florida Fairgrounds. ARRL North Florida Section. Commercial areas feature over 200 vendors, and swap area includes over 400 tables. Tailgating, forums, testing. Overnight RV parking with electric and water. Commercial Information, Tim Starr, (407) 850-9258. E-mail [AE4NJ@aol.com], visit our Web page at [WWW.OARC.ORG] or send SASE to: **Orlando HamCation™**, P.O. Box 547811, Orlando FL 32854. BNB213

VisualRadio® is a powerful control software for AOR, ICOM, Kenwood, JRC, YAESU and more. Starting at US$ 122. Download demo: [http://ourworld.compuserve.com/homepages/visualradio]. For info/order: **Cord Schuette**, St. Johns MI. TEL/FAX: (517) 224-1791. E-mail: [Schuette@email.mintcity.com]. BNB601

WANTED: NYE VIKING STATION MONITOR RFM-003, RFM-005. Paying $600. Randy Ballard N5WV, **(903) 687-3002**; [TMT@Prysm.net]. BNB5001

ASTRON power supply, brand-new w/warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249, **AVT**. Call for other models. **(626) 286-0118.** BNB411

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone:** (616) 925-5899, 8–4 ET. BNB964

NEVER SAY DIE

continued from page 61

officer during the war in Vietnam and had never gotten one useful piece of information from any of the intelligence agencies. Army Intelligence truly is a contradiction of terms.

Too bad if you missed the *New Yorker* article. This was the magazine that forced the AMA to admit that ulcers are caused by the *Heliocobacter Pylori* germ and could be cured quickly with antibiotics, news that has cost the medical establishment billions of dollars in endless doctor visits for the old ineffective ulcer treatments. On the positive side, a recent survey showed that thousands of doctors are still happily unaware of the new treatment — and probably intend to stay unaware of it.

Sporadic E

A note from Neil Spokes AB4YK points out that sporadic E is anything but sporadic, in the sense of being non-predictable. These events repeat every year, over and over, on the same days. Thus they must be tied into where the Earth is in its orbit, going through something — perhaps a cometary effect.

My Ballot

The Official ARRL Ballot, allowing me to vote for the Vice Director, arrived. Apparently no one was interested enough in the job to run for Director, so our old used Director is holding down the spot for two more years. I looked over the promotions for the two contestants for Director of Vice. One was Andrea Parker K1WLX. Her promotion told all about her marvelous accomplishments, but said nothing about how I or even the hobby might benefit from her important self being elected. Also, she was not smiling in her photo. Her look said to me that she's very, very important and I'm an insignificant something that probably stuck to someone's shoe.

The opponent in the election was Michael Raisbeck K1TWF. His piece was almost all about the things he wanted to do to make the hobby better, with just a short paragraph at the end about himself. And he was smiling in his photo.

Care to guess who I voted for? Make a wild stab. 73

JRC

JST-245

160-10 Meters PLUS 6 Meter Transceiver

Fifteen reasons why your next HF transceiver should be a JST-245. . .

1 All-Mode Operation (SSB,CW,AM,AFSK,FM) on all HF amateur bands and 6 meters. JST-145, same as JST-245 but without 6 meters and built-in antenna tuner.

★ JST-145 COMING SOON ★

2 MOSFET POWER AMPLIFIER • Final PA utilizes RF MOSFETs to achieve low distortion and high durability. Rated output is 10 to 150 watts on all bands including 6 meters.

3 AUTOMATIC ANTENNA TUNER • Auto tuner included as standard equipment. Tuner settings are automatically stored in memory for fast QSY.

4 MULTIPLE ANTENNA SELECTION • Three antenna connections are user selectable from front panel. Antenna selection can be stored in memory.

5 GENERAL COVERAGE RECEIVER • 100 kHz-30 MHz, plus 48-54 MHz receiver. Electronically tuned front-end filtering, quad-FET mixer and quadruple conversion system (triple conversion for FM) results in excellent dynamic range (>100dB) and 3rd order ICP of +20dBm.

6 IF BANDWIDTH FLEXIBILITY • Standard 2.4 kHz filter can be narrowed continuously to 800 Hz with variable Bandwidth Control (BWC). Narrow SSB and CW filters for 2nd and 3rd IF optional.

7 QRM SUPPRESSION • Other interference rejection features include Passband Shift (PBS), dual noise blanker, 3-step RF attenuation, IF notch filter, selectable AGC and all-mode squelch.

8 NOTCH TRACKING • Once tuned, the IF notch filter will track the offending heterodyne (±10 Khz) if the VFO frequency is changed.

9 DDS PHASE LOCK LOOP SYSTEM • A single-crystal Direct Digital Synthesis system is utilized for very low phase noise.

10 CW FEATURES • Full break-in operation, variable CW pitch. built in electronic keyer up to 60 wpm.

11 DUAL VFOs • Two separate VFOs for split-frequency operation. Memory registers store most recent VFO frequency, mode, bandwidth and other important parameters for each band.

12 200 MEMORIES • Memory capacity of 200 channels, each of which store frequency, mode, AGC and bandwidth.

13 COMPUTER INTERFACE • Built-in RS-232C interface for advanced computer applications.

14 ERGONOMIC LAYOUT • Front panel features easy to read color LCD display and thoughtful placement of controls for ease of operation.

15 HEAVY-DUTY POWER SUPPLY • Built-in switching power supply with "silent" cooling system designed for continuous transmission at maximim output.

JRC *Japan Radio Co., Ltd.*

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CIRCLE 159 ON READER SERVICE CARD

The New Approach to HF Radio!

The Kachina 505DSP Computer Controlled Transceiver

Features:

- Works with any Computer Running Windows 3.1, 95 or NT
- Covers all Amateur HF Bands plus General Coverage Receiver
- IF Stage 16/24 Bit Digital Signal Processing (DSP)
- II DSP Bandpass Filter Widths from 100 Hz to 3.5 kHz (6 kHz in AM Mode)
- Band Activity Display with "Point and Click" Frequency Tuning
- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

The Kachina 505DSP Computer Controlled HF Transceiver After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

Why Use Knobs If You Have Windows? The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

16/24 Bit DSP/DDS Performance In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDS performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add *lots* of punch to your transmitted signal without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

Seeing is Believing American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at http://www.kachina-az.com for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

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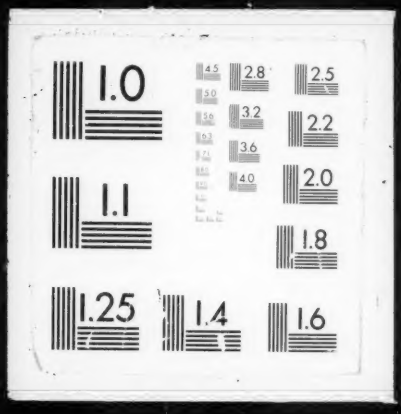
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